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Sustainable Product Design and Development; *exploring the applicability of European experiences*

An analysis of sustainable product design tools, techniques and policy in Europe, and how they can be introduced to the New Zealand context.

Executive Summary

This report is an investigation into 'ecodesign' within the European context assessing how successful elements of its implementation can be applied to the New Zealand context.

Ecodesign has been defined as considering conventional design criteria with the addition of environmental factors, whereas 'sustainable product design' includes environmental and social criteria.

To understand the function of ecodesign it is useful to examine how the various stakeholders interact. Within the EU context ecodesign functions between three key sectors: these are political, commercial and research (which incorporates academia). Each of these sectors has a different agenda but an equally important role to play in the implementation of 'Sustainable Development'. The broad relationships that exist between these sectors are illustrated for clarity in Figure 1.

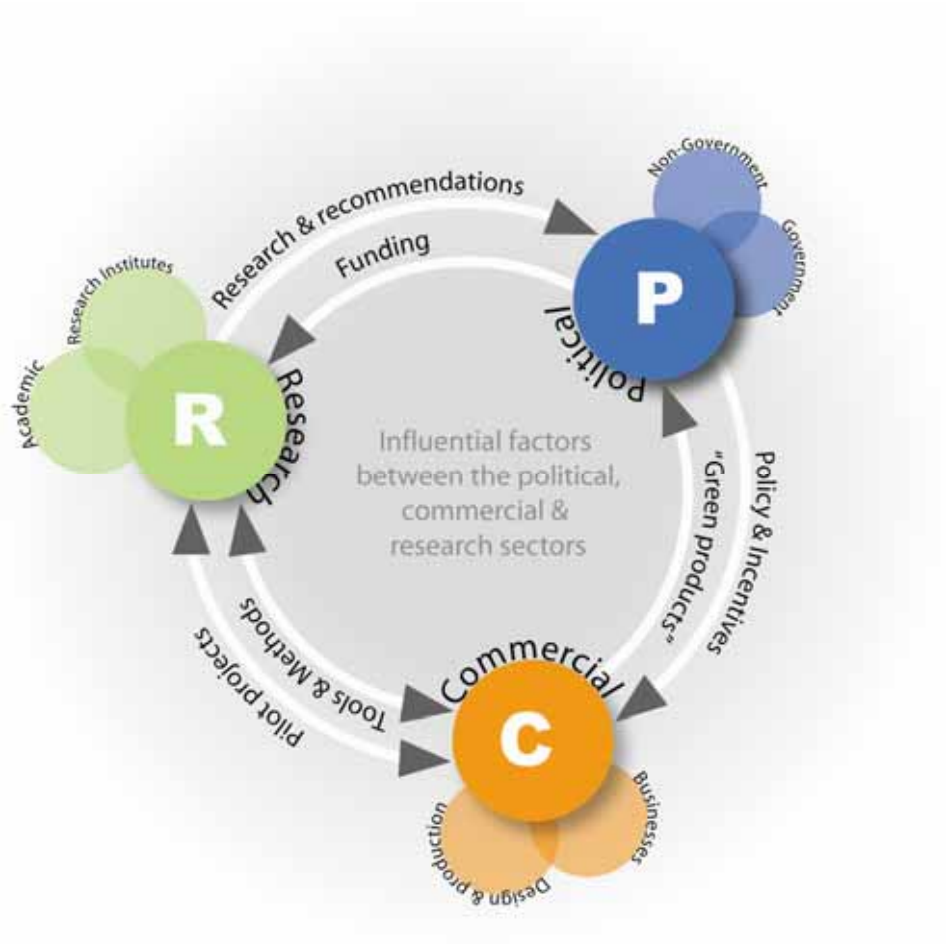
The political arena has focussed on policy-based mechanisms, with incentives to assist industry. The development of the 'extended producer responsibility' (EPR) principle has driven individual policies such as the Waste Electrical & Electronic Equipment directive (WEEE) and the Restriction of Hazardous Substances directive (RoHS).

The commercial sector has been driven by this incoming policy. It has been given co-funding from government for pilot projects to create more sustainable products. These projects have in many cases been conducted with academic research organisations.

The research sector has been driven by government programmes that fund research rather than by industry. The relationship between the research and political sectors is reciprocal with the research sector providing expertise and further research and recommendations back to government.

The policy-oriented approach has created a paradox. On the one hand it has created the growing knowledge base for applications in the last 15 years, but the framework has also created some barriers to long-term implementation. A key barrier is the gap between academic research and industry application. This has resulted from a lack of real industry integration into the programmes. It has also resulted in an overt focus on 'compliance driven' or 'incremental' product improvement as opposed to an innovation, new product development oriented strategy.

Figure 1 Commercial research & political relationships



A wide range of aspects can be drawn out of the European experience for application to the New Zealand context. Some of the key findings are as follows:

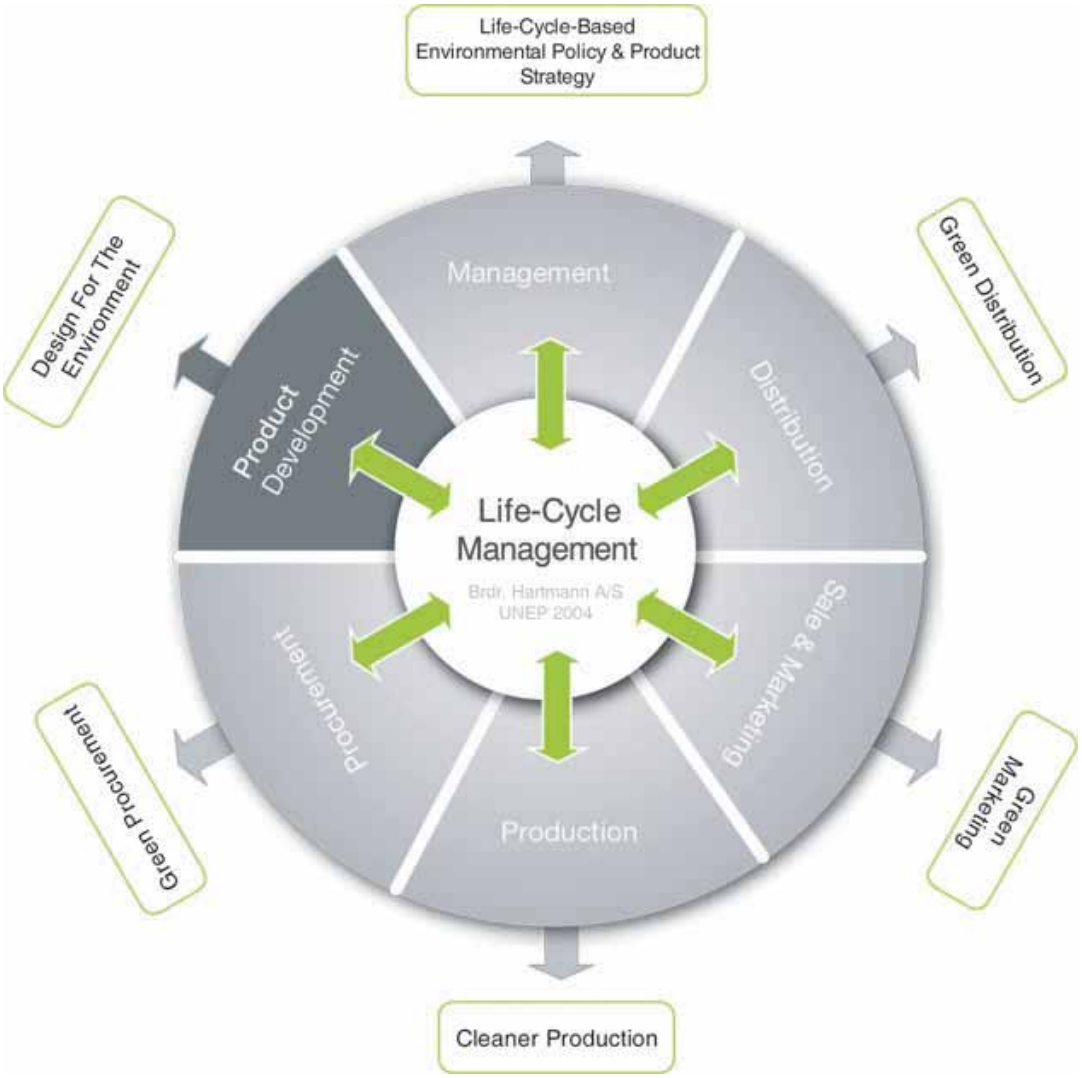
- Awareness raising campaigns should involve the end consumer to help catalyse market driven changes
- The company context has a profound impact of the effectiveness of ecodesign
- Existing product redesigns can lead to reduction of environment impact
- Successful ecodesign pilot projects are no guarantee that the approach will be used on a day-to-day basis
- Teaching and training of environmental staff does not mean it will be applied to the wider organisation
- Ecodesign needs to be strategically implemented for the benefits to be realised
- Environmental management systems are a way of integrating ecodesign into a continuous part of normal business operation
- On a tertiary level all lecturers will have to grasp and integrate the concept of sustainability into their own courses
- There is a language gap between stakeholders that needs to be addressed
- The tools and methods for ecodesign need to be customised for a company's particular needs
- There is a strong business case for ecodesign but awareness of this is low.
- Tool and strategy selection is important to industry.

In New Zealand ecodesign awareness has been fairly low in most sectors and has

only been implemented in a few progressive companies with varying results. To implement ecodesign effectively it is critical to address this and build the general awareness of ecodesign and change the current stereotypes held over what eco-products are.

This research identifies that it is essential companies integrate sustainable thinking into the organisation as a whole to effectively 'enable' ecodesign. Ecodesign needs to proactively address 'business integration' to effect greater improvement. Design is only one segment of the whole equation and requires involvement and input from a wide range of stakeholders within an enterprise to create change.

Figure 2 Life Cycle Management - Business Integration[1]



The wide range of tools, methods, and guidelines that have been produced represent a significant resource that can be built on within New Zealand. These tools operate at a strategic level to help determine 'where' a company should focus, through to specific analysis of material factors. Preference should be given to tools that can operate across management, technical and design staff such as the LiDs Wheel and MET matrix. These tools can be used to both build understanding and consensus.

[1] Diagram developed by Locus Research based on UNEP Manual on Life Cycle Management

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We would like to thank Jan Carel Diehl and Han Brezet from the Design for Sustainability program at Delft Technical University, without their support and willingness to give up their free time to help and direct the research this project would not have been possible. We would also like to extend thanks to the other members of the Design for Sustainability team for their insight and valuable advice, in particular Oriol Pascual, Casper Boks and Hanna Hellman.

Several interviews outside the academic sector were undertaken to get an overview of some of the real life applications of sustainable product design. Each interview offered a new perspective and shed light on the reality of applying the tools and methods developed for sustainable product design. Regards and thanks to Siem Haffmans from ID-L, Paul Eilbracht from Design 4U and Arianne Bijma from Arcana consultancy.

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1 Introduction & Background

As part of a research project called 'Recircle', Locus Research has been investigating ways to catalyse sustainable product design in New Zealand. A key component of this has been a 5 month research opportunity for designer Josh Astill in the Netherlands, alongside expert staff from Delft Technical University.

This 'Recircle' research has provided the Ministry for the Environment with an opportunity to gather information on the applicability of EU sustainable product design experiences to New Zealand. This report presents such information, including figures and tables developed as part of the 'Recircle project'.

2 Assumptions

This research has been compiled by a researcher who was resident at the Delft Technical University in the Netherlands from October 2005 to February 2006. All the material included in this report is a result of that broad investigative research.

Because of the breadth of the subject the decision was made to focus on 'Ecodesign' and not on 'Sustainable Product Design.[2]'

This report attempts to deal with the major institutions and trends in relation to ecodesign in the European context. Whilst it is thorough, it is not possible to be exhaustive given the breadth of the approach taken. The key objective is to paint a picture of the EU context and the relationships that have been critical to the establishment and development of their sustainable design activity.

3 Glossary

SPD	Sustainable Product Design
EU	European Union
EC	European Commission
NZ	New Zealand
SME	Small to Medium Sized Enterprise (EU Class)
OEM	Original Equipment Manufacturer (usually a large enterprise)
Enterprise	Large Corporate
DGE	Directorate General for the Environment, which is part of the European Commission.
Delft TU	Delft Technical University
End of pipe	A strategy dealing with product waste and emissions
LiDS	Life cycle Design Strategies
WEEE	Waste Electrical and Electronic Equipment
RoHS	Restriction of Hazardous Substances
EuP	Ecodesign of energy Using Products
EOLV	End Of Life Vehicles
IPP	Integrated Product Policy
EEB	European Environmental Bureau
EEA	European Environmental Agency
VROM	Dutch Ministry for housing, spatial planning and the environment

[2] Refer to 'Defining Sustainable Product Design' section of this document.

LCA	Life Cycle Analysis
UNEP	United Nations Environmental Program
SETAC	Society for Environmental Toxicology And Chemistry
EPR	Extended Producer Responsibility

4 Defining Sustainable product design

4.1 Introduction

It is generally held that the current patterns of production and consumption cannot be sustained in a world of growing population, rising human aspirations and limited resources. There has been considerable work undertaken over the last decade to improve the sustainability of products and services. The initial focus was on the reduction on environmental impact, but this has grown to include socio-cultural considerations, which is holistically termed 'sustainable development'.

The term 'sustainable development' is defined as "*a development that meets the needs of the present without compromising the ability of future generations to meet their needs*"[3]. It broadly describes the consideration of economic, environmental and social factors and is effectively illustrated in the Jensen and Remmen diagram in Figure 3.

Figure 3 Sustainable Development[4]

Whilst it may appear academic, it is important for this report that we provide a context for what 'conventional design', 'ecodesign' and 'sustainable product design' are and how they relate to the broader field of sustainable development. This also helps to define the report scope against internationally accepted terminology.

4.2 Ecodesign and Sustainable Product Design

The application of sustainability in the field of product design was catalysed in the late 1980's and early 90's and has gradually accelerated since then. The initial impetus was directed at what is called 'Design for the Environment' or 'Ecodesign'. The term 'ecodesign' will be used as it has the widest acceptance and use. A good definition of ecodesign is that it '*considers environmental aspects at all stages of the product development process, striving for products that make the lowest possible impact throughout the product life-cycle*[5]'.

[3] Brundtland Report (Our Common Future) 1987
[4] Sustainable Development - Jensen & Remmen UNEP 2004 (Diagram Reproduced By Locus Research)
[5] Brezet & Van Hemel (1997)

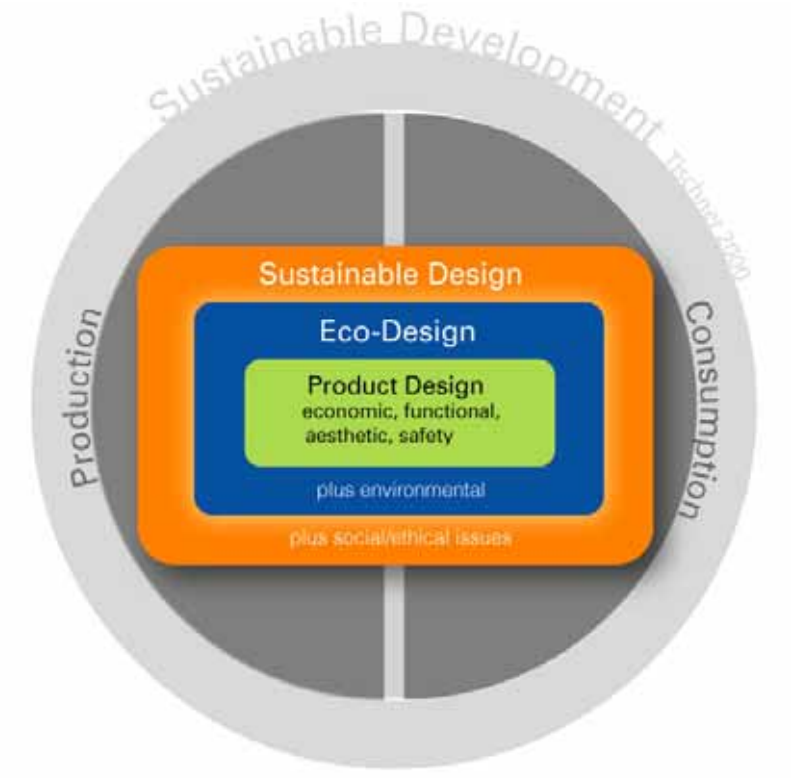
Table 1 illustrates some of the wide and varied terms that have been used to describe the field of ecodesign; these terms all describe the same field of endeavour.

Table 1 Related Descriptions/Terms of Ecodesign

- Design for the Environment (DFE)
- Ecological design
- Environmental design
- Environmentally oriented design
- Ecologically oriented design
- Environmentally responsible design
- Green design
- Life-cycle design

Ecodesign has provided the platform for the growth of what is now called 'sustainable product design'. In Europe the growth of sustainable development has resulted in '*the focus shifting from ecodesign, focussing only on the environmental and economical aspects towards* ***sustainable design*** *that also includes social aspects. This new development aims at the integration of the needs of the "Triple P" (people, planet, profit) into product design.*[6]' This signals the emergence of sustainable product design as a field. Beatrice Otto in her report to the British Design Council defined SPD as "*The (re) design of products, processes, services or systems to tackle imbalances or trade offs between the demands of society, the environment and the economy and requires the holistic consideration of the impact or products or services in these three areas, now and in the future.*[7]" Figure 4 illustrates where product design, ecodesign, and sustainable design sit in relation to each other.

Figure 4 The Definition of SPD and Ecodesign[8]



[6] 'Go to Sustainable Design' – JC Diehl, Ana Mestre, 2003
[7] 'About: Sustainability' Beatrice K Otto – Design Council, 2002
[8] Ursula Tischner 2000 – Reproduced by Locus Research

This report has elected to focus on ecodesign due to a range of factors. These are listed as follows:

- Most of the European research and development has occurred within the field of ecodesign
- Through the application of ecodesign to industry a wide range problems have been identified in successfully applying ecodesign to the industrial commercial context
- There has been a general delay in uptake, even with pending and current legislation
- There is limited evidence that a product designer is meaningfully engaged in ecodesign let alone sustainable product design
- There is little evidence to support designers operating in a social arbitration role within a company.

This clear distinction provides companies with a stepping stone from design to ecodesign and onward to sustainable product design. It also enables the New Zealand design profession and manufacturing industry to communicate accurately with international experts in the field.

5 The European Context

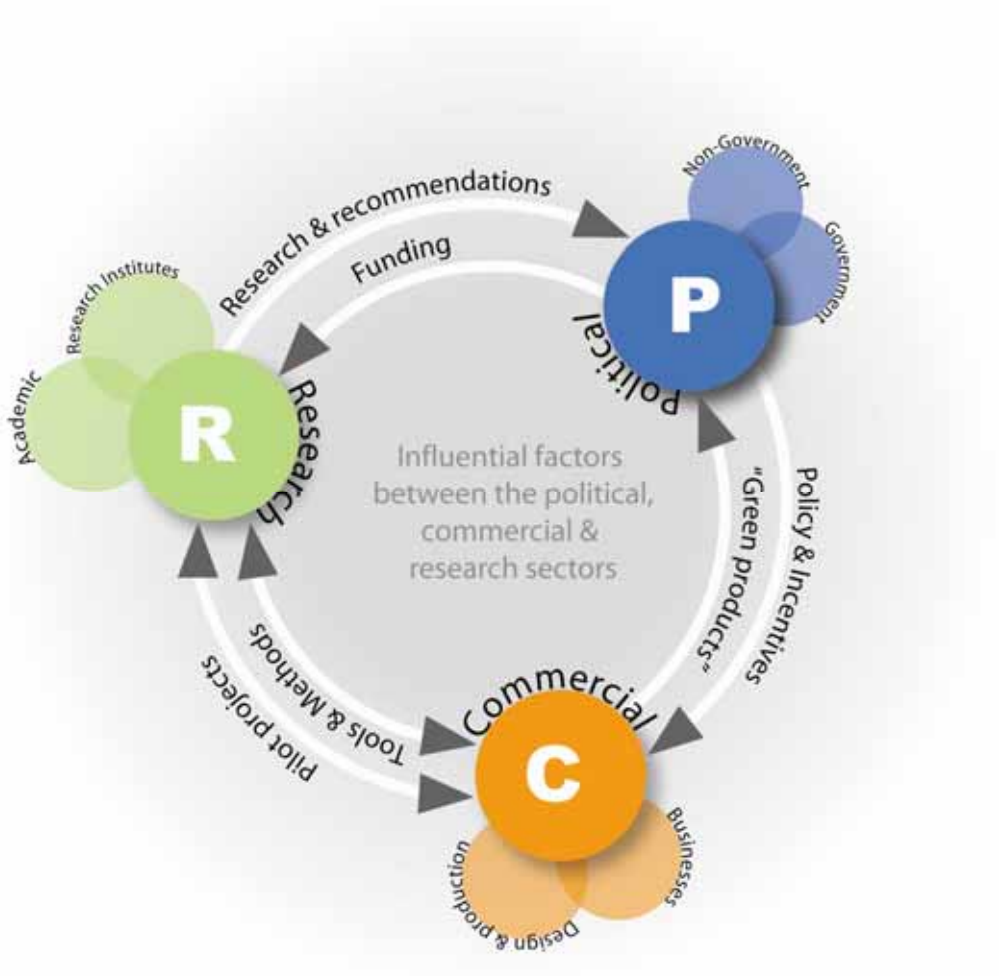
This section explains some of the structure, key organisations, and initiatives in the European Union (EU) in order to provide a platform for the development of sustainable product development within the New Zealand context. At a broad level the key organisations can be grouped into 3 sectors: these are political, research, and commercial. Each of these sectors has a different agenda but an equally important role to play in the implementation of 'sustainable development'. The broad relationships that exist between these sectors are illustrated for clarity in Figure 5.

The political arena has focussed on policy-based mechanisms, with incentives to assist industry. The development of the 'extended producer responsibility' (EPR) principle has driven individual policies such as WEEE and RoHS from central government.

The commercial sector has been driven by incoming policy, and has been given financial incentives to instigate positive change through funding for pilot projects. These projects have in many cases been conducted with academic research organisations.

The research sector has been driven by government incentive programmes that fund research rather than by industry. The relationship between the research and political sectors is reciprocal with the research sector providing expertise and further research and recommendations back to government.

Figure 5 Key Sector Relationships



The EU and its member states are one of the international leaders in environmental solutions whether it is new tools and technologies or the development of governmental policy. This report investigates the European context to establish the drivers and barriers to implementing ecodesign and to evaluate the efficacy of the approach that has been adopted within the central government framework they have adopted.

The EU has taken a legislative approach that enforces a holistic view of a product and has adopted a 'polluter pays' principle based on the 'extended producer responsibility' concept. That is, the manufacturer is responsible for the entire lifespan of a product not just its production.

Government policy has had a wide-ranging impact on the development of ecodesign in the EU. High impact areas such as automotive and electronics have been the initial target but the EU plans to extend policy into other sectors. In these areas collective effort from industry and academic groups has resulted in new tools and methods that have enabled companies to design products that will meet the legislative requirements.

An output of this process has been the recognition that there are a range of business benefits that can be generated from ecodesign. These benefits could emerge as one of the key drivers for ecodesign and those companies that have a strategic and pro-active approach are likely to open the door to creative innovation.

The Small to Medium Enterprise (SME) sector has been targeted by the EU as a means of driving the uptake of Ecodesign through a number of innovative programmes such as 'Ecosme's' that have involved research and academic institutes, industry and the professional community.

There is a wide range of organisations that are involved with the development of Ecodesign. The coordination of these has been manifested through establishment of networks that operate on an international, national and regional level such as UNEP, Suspronet and O2.

The EU also has a number of member states that have national and regional programmes. These programmes utilise different approaches and are at different stages of maturity and should form an effective resource for New Zealand's push toward a more sustainable manufacturing, academic and design sector.

5.1 Key Organisations

Ecodesign is a cross functional discipline involving a range of organisations from different sectors such as the research and academic, political and commercial sectors. Table 2 provides an overview of the influential organisations by categorising the areas they are involved with. Some organisations operate in several spheres.

Table 2 Key Organisations

Key EU Organisations		Education	Political	Commercial	Research	Comment
Academic	TU Delft (D4S)	Yes		Yes	Yes	Influential Dutch Technical University (D4S program)
Academic	Chalmers (CPM)	Yes			Yes	Competence Centre for Environmental Assessment of Product and Material Systems (Goteburg, Sweden)
Academic	TU Vienna	Yes			Yes	Austrian Technical University (Ecodesign Pilot)
Academic	Center For Sustainable Design (CFSD)	Yes			Yes	UK based research institute (Publishers of the journal for sustainable product design)
Academic	Milano Polytechnic	Yes			Yes	Italian Polytechnic influencial in the develoment of PSS methodologies.
Commercial	Philips			Yes	Yes	Dutch Electronics company
Commercial	Volvo			Yes	Yes	Swedish Automotive company
Commercial	Electrolux			Yes	Yes	Multinational domestic appliance producer
Commercial	PRE			Yes	Yes	Dutch LCA Software tool developer
Central Government	European Commission		Yes			European Commission (Central Government)
Central Government	European Environmental Agency (EEA)		Yes		Yes	Provides the Information about the stated of the Environment. Coordinate the European environment information and observation network (Eionet)
Central Government	DGE	Yes	Yes			Directorate General for the Environment, part of the European Commission.
National Government	VROM		Yes		Yes	Dutch Ministry for Housing, Spacial Planning and the Environment
National Government	Envirowise			Yes	Yes	UK based organisation offers free Government supported advice and consultation to business to encourage the use of environmentally friendly
National Government	Danish EPA		Yes			Dannish Ministry for the Environment (Environmental Protection Agency)
Non Governmental	European Environmental Bureau (EEB)		Yes		Yes	Provides info in current and upcoming EU environmental policy
Research	Fraunhofer			Yes	Yes	Largest organisation for applied research in Europe
Research	Vito			Yes	Yes	Flemish institute for technological research
Research	Wuppertal Institute		Yes	Yes	Yes	The Wuppertal Institute explores and develops models, strategies and instruments to support sustainable development at local, national and
Research	TNO			Yes	Yes	Dutch Research Institute
Research	SETAC	Yes			Yes	The Society of Environmental Toxicology and Chemistry

Please note: In the above table, central government refers to the European Union which is a multinational body.

Ecodesign is primarily driven from central government within the environmental arm of the European Commission (EC). The EC funds a wide range of projects and initiatives that have enabled academics, industry and researchers to develop new tools and techniques for Ecodesign.

The Directorate-General for the Environment (DGE)[9] is a department of the European Commission, responsible for the policy area of the environment. A principal role of the DGE is to initiate and define new environmental legislation and to ensure that measures, which have been agreed, are actually put into practice in the member states. The DGE works with other EU organisations such as the Joint Research Centre (JRC) and the European Environmental Agency (EEA) to develop the policies and

[9] http://europa.eu.int/comm/environment/index_en.htm

create a framework for their implementation. Through instruments such as LIFE[10], the DGE funds conservation, policy and technical projects such as DANTES.[11]

DANTES is an acronym for Demonstrate and Assess New Tools for Environmental Sustainability. DANTES concluded in August of 2005 and dealt mainly with environmental activities that are usually characterized as voluntary rather than regulatory. One of the project's goals was to assess and demonstrate tools such as Life Cycle Assessment, Environmental Risk Assessment and Life Cycle Costing. DANTES also resulted in strategies for eco-efficiency evaluation based on existing tools.

The DGE interfaces with a wide range of organisations within the EU from academic institutes (such as Delft TU), industrial partners (such as Akzo Nobel) and NGO's (such as the EEB[12]). This effectively makes it one of the most influential organisations related to Ecodesign in the EU.

The European Environmental Agency (EEA) is a separate governmental organisation that collects and provides data about the environment. It informs policy and provides guidance for EU member states and coordinates the European Environment Information and Observation Network (Eionet). So the EEA only plays an indirect role through policy advice and development.

National organisations are run within EU member states that relate to EU initiatives but are largely independent. For example 'Envirowise'[13] in the UK, which assists companies reduce their environmental impact and create cost efficiencies.

Commercial research companies such as Fraunhofer[14], which is the largest independent applied research company in the EU, are involved with initiatives such as the ecodesign awareness raising campaign (refer to 5.3.2)

A cornerstone of the research and development of new tools and methods has been the academic institutes such as Delft D4S programme in the Netherlands and the Centre for Sustainable Design (CFSD) in the UK.

5.1.1 The Delft TU Programme

The research conducted in this report was primarily undertaken at Delft Technical University (Delft). Due to Delft's huge experience in the area of ecodesign it is appropriate to discuss their programme in more detail as a key EU organisation.

Since 1992 the 'Design for Sustainability' (D4S) program (ca. 20 staff members) has focused on the design, management and systems for sustainable products with a large part of the research being executed internationally. On the request of the United Nations Environment Program (UNEP) the D4S together with the IIIEE Institute of the Lund University in Sweden coordinates the production of a universal design for sustainability learning package (ecodesign manual). Several research groups worldwide contribute either via available inputs or through testing the draft learning materials in small pilot projects. The UNEP Ecodesign manual has been the benchmark for Ecodesign implementation since its first release in 1993, with a revised and updated version due out in 2006.

Delft does not operate as a stand-alone institute in this field and collaborates actively with a wide variety of organisations depending on the scope of the research and desired outcomes.

[10] http://europa.eu.int/comm/environment/life/home.htm
[11] http://www.dantes.info/index.html
[12] http://www.eeb.org
[13] http://www.envirowise.co.uk
[14] http://www.fraunhofer.de

5.1.2 UNEP

Since 1989 the United Nations Environment Programme (UNEP) has been working to improve current production patterns through its 'Cleaner Production' activities. It has been involved with the international discussion since the UN Conference on the Environment and Development[15] in Rio de Janeiro (1992). UNEP is a key contributor in the debate on how to achieve sustainable production and consumption.

The 'sustainable consumption' (SC) programme started in 1998 and, focuses on understanding the forces that drive consumption patterns around the world and how to translate those findings into tangible activities for business and other stakeholders.[16] Within the SC programme UNEP is pursuing the development of a '10-year Framework' of programmes on sustainable consumption and production (Marrakech process) in support of regional and national initiatives.

Along with the framework is the Life cycle initiative, which is a collaborative project between UNEP and SETAC.[17] This aims to develop and disseminate practical tools for evaluating the opportunities, risks, and trade-offs associated with products and services over their entire life cycle.

Another role of the SC programme is to develop guidelines for governments to put frameworks in place that facilitate and enable consumers and producers to change consumption and production patterns. This is further reinforced with their promotion of ecodesign and product service systems as options for implementing more sustainable consumption and production patterns. The SC programme as a whole is considered to be one of the key international governing figures regarding ecodesign and its implementation on a global scale. The influence of this program has resulted in a trickle down effect to almost all other sustainable development initiatives.

5.2 Policy

Discussing the importance of governmental policy within the EU requires an introduction to the policy that is driving change. This section introduces the principles behind the policy as well as some of the implemented policies that are driving change. Figure 6 in section 3.2.2 provides an overview of the policy framework.

5.2.1 Extended Producer Responsibility

The most influential area of environmental policy appears to have been the development and gradual implementation of extended producer responsibility (EPR). EPR is a basis for government policy and programs to reduce waste and environmental impacts from the end of life disposal of goods. The OECD defines EPR as:

The principle that manufacturers and importers of products should bear a significant degree of responsibility for the environmental impacts of their products throughout the product life cycle, including impacts [from] . . . the selection of materials, the . . . production process, and . . . from the use and disposal of the products.

However existing environmental product-related policies developed under the EPR principle, have tended to focus on large point sources of pollution, such as industrial emissions and waste management issues, rather than the products themselves.

[15] http://www.un.org/geninfo/bp/enviro.html
[16] http://www.uneptie.org/pc/sustain/home.htm
[17] http://www.setac.org/

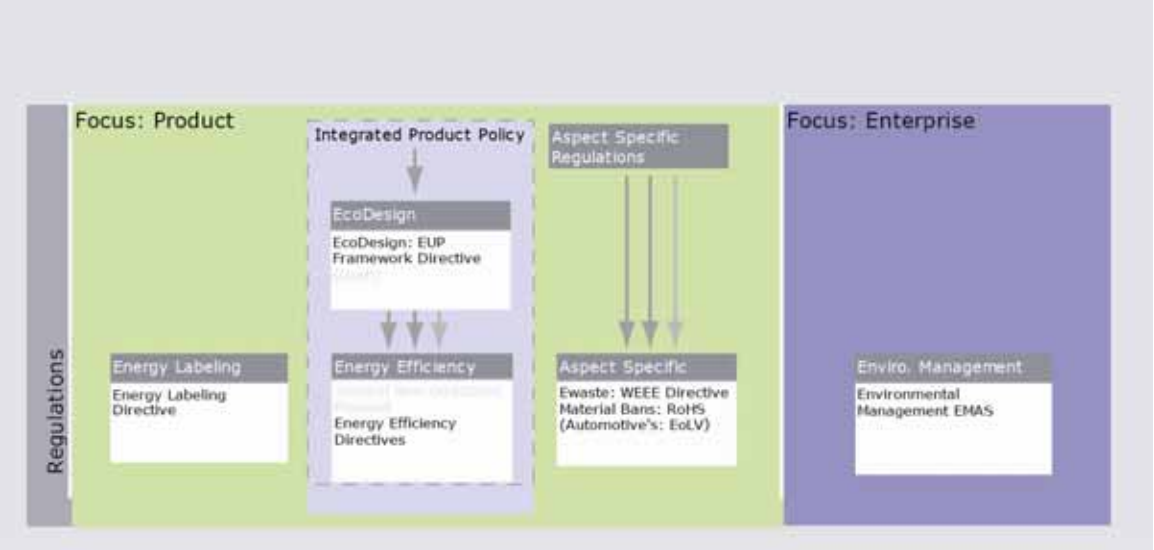
5.2.2 Integrated Product Policy (IPP)

In 2003 the European commission adopted IPP. IPP is an initiative aimed at reducing the environmental burden of products and services. IPP advocates "life-cycle thinking", which means that measures for pollution reduction are searched for in the complete life cycle of the product – with specific focus on eliminating the environmental problem at the source. In principle, all products and services fall within the scope of the IPP.[18]

IPP is not envisioned to be a stand-alone policy but to be integrated into already existing EU policies and objectives. IPP is a key strategy for EU environmental policy, and is flexible as to the type of policy measure to be used. It is a framework policy under which more specific directives are placed such as the EuP[19] directive.

"As a response to government action, there is a clear change in orientation on the part of industry. Strategic planning by leading companies, investment in new technology and production processes, the reorientation of business practice and R&D spending all suggest a broad level of acceptance that issues of waste and pollution are of such significance that major structural change to current industrial production is inevitable".[20]

Figure 6 EU Policies and Legislation



5.3 Initiatives and Projects

Ecodesign has developed through the collaboration of academic, commercial, governmental and non-governmental organisations. It is dependant on many sectors; as such it is imperative that coordination between the sector organisations is efficient and functional. The following examples of projects, collaborations and initiatives illustrate some key examples of how this has been undertaken in the EU context at both macro and micro levels.

5.3.1 Stakeholder Projects funded by the EU Commission

A lack of awareness and availability of information about ecodesign in companies in

[18] Teaching material on environmental benign product design, 2005
[19] (EuP) Eco-design of energy using products directive
[20] Design + Environment – Lewis & Gertsakis 2001

the SME sector has been identified as a key issue for the EU commission to overcome. With the pending environmental directives such as WEEE, RoHS & EUP[21] there has been a focus on informing SME's about implications of legislation, and enabling them to comply without detriment to their business.

Several EU funded multi-stakeholder projects have been run over the past few years to aid with policy compliance and the uptake of ecodesign in the SME sector. The two examples summarised here are:

1. Raising Ecodesign Awareness campaign
2. ELCA2: Databases and website for the adoption of IPP

5.3.2 Raising Ecodesign Awareness[22]

This is an influential programme that is highly relevant to the New Zealand context. The document entitled "Raising Ecodesign Awareness" is appended for reference.

On behalf of the European Commission, DG Enterprise, Fraunhofer IZM, PlanMiljo and partners carried out a project "Promoting Eco-design Activities in the Small and Medium Sized Enterprises (SME's) of the Electrical/Electronics Sector". The partners were universities, chambers of commerce, industry associations, consultants and other related organisations. The aims of the project were to increase awareness of EU policy and best practices in ecodesign and identify appropriate types of assistance for helping SME's in implementing ecodesign.

This was achieved through ecodesign 'awareness raising' workshops in 21 countries in the EU, which were attended by approximately 1200 participants. These workshops were considered highly successful. "*Industry associations and larger enterprises have played an important role in contributing to the announcements and presentations at the workshops. In some countries the workshops have been the first events on ecodesign for the electrical and electronics sector ever, for example in Turkey and Bulgaria*". Presentation topics included:

- Basics in eco-design including concepts, strategies and tools
- Innovative technology concepts
- Life Cycle Assessment concepts and implementation
- Status on EUP, RoHS, WEEE and IPP
- Green Public Procurement
- SME and large company's eco-design case studies
- SME lead free transition case studies.

5.3.2.1 Key Conclusions of the campaign

SME ecodesign business cases are not as high profile as those of the larger electronics multinationals such as Philips or Sony. This knowledge gap is contributed to by the lack of SME case studies. In order to make ecodesign more accessible, this programme collected 26 ecodesign case studies, which have been consolidated into teaching material[23].

In general most SME's utilising ecodesign follow a 'pragmatic' rather than a 'multi dimensional' approach incorporating life cycle thinking. There was a lack of consistency and depth characterised by a 'compliance driven' approach. This prevented a more innovation-focussed approach being adopted. In order to implement ecodesign there were three requirements that were identified:

[21] Refer to Appendix 3 – Introduction to ecodesign - Ecodesign ARC project, 2005
[22] http://www.Ecodesignarc.info/ - This site contains all relevant information to this development programme. Including all summary reports.
[23] Case studies - www.ecodesignarc.info/servlet/is/795/

1. A clear commitment by the management for a pro-active environmental product strategy
2. The knowledge of ecodesign on an engineering level (support through easy to use tools or checklist, or clear environmental specifications)
3. Involvement of all relevant parties within an enterprise.

This awareness raising campaign was the first Pan-Europe project, and it clearly demonstrated the benefits of targeting SME's and providing greater support, exposure and education in the area of ecodesign.

5.3.3 ELCA2: Databases and Website for the Adoption of IPP by SME's[24]

The aim of the project was to develop a web site to provide information, tools and services to enable SME's to develop and market "green products" (with specific reference to IPP).

The resulting website www.ecosmes.net represents a pivotal resource, not just for compliance but also for supporting the adoption of IPP, which remains in its infancy. The website has also targeted public support networks and technical 'mediators' to ensure full support for SME's.

The principles of the website include multi-lingual support, concise information, online solutions, and access to experts. It also provides services such as a simplified LCA tool (eVerdee), an ecodesign tool (Tespi[25]), and life cycle inventory (DIM) to manage and create inventory information, and technical guidelines.

Tespi is of particular interest as it enables a company to evaluate and prioritise quality as well as environmental aspects of a product together. For example there may be a trade off between a critical customer requirement and the ecodesign gains. An excellent case study is the Artica cooker hood (Refer to Appendix 1: In depth case studies). This also provides business with an incentive to utilise the tool, as they will gain a better understanding of their product at the same time as prioritising the environmental concerns.

Ecosmes was set up to become self supporting over the long term through building services that could be charged out. However, with IPP being implemented slowly, and SME uptake also slower than expected (attributed to perceptions of extra costs around ecodesign), the services and information remain relatively freely available today.

5.4 Regional Differences

Anecdotally, it is the Northern European countries (in particular Sweden, Denmark & Finland) that are leading the way when it comes to developing and applying new tools and methods for ecodesign. Their approach has originated from a strong academic and research based foundation, but has moved past policy compliance into identifying and creating business advantages such as increased efficiency and market perception. For these reasons, combined with strong governmental support for these activities, the Scandinavian counties are often considered as being at the forefront of ecodesign implementation.

Ecodesign is a very regional issue particularly at an SME level and needs 'sound

[24] http://www.ecosmes.net
[25] Refer to the Case study 'Artica' cooker hood for use of this tool.

infrastructure[26]' to provide effective assistance for it to flourish.

The Scandinavian economies, such as Finland, have a striking resemblance to New Zealand. This coupled with their innovation driven approach to ecodesign would establish them as a key area that New Zealand can learn from. This is a comparison that was also highlighted at the Betterbydesign[27] conference by Yrjö Sotamaa.[28] The models for ecodesign implementation and application developed by these nations should be investigated further to assess the applicability to New Zealand.

Table 3 describes the level of awareness in the different countries that participated in the ecodesign awareness raising campaign. It is to be noted in the report that this represents a small number of SME's and that ecodesign is still not a broad mainstream movement.

Table 3 Regional Differences in ecodesign at SME level [29]

region	SME awareness	infrastructure	approaches
Scandinavia	high	very good (academia focussed) *eco-design clusters: DK, SE*	LCA focussed, lot of funded projects undertaken
UK	high	very good (consultancy focussed) *eco-design cluster: England/Wales*	Based on RoHS, WEEE as entry point
Netherlands, Belgium	high	very good (research focussed) *eco-design cluster: Flanders*	LCA focussed, governmental support
Germany, Austria	high	very good *no dedicated cluster*	Technology focussed, tool development, backed by educational measures
Ireland	high	good	
Spain	high	good *eco-design sub-clusters: Catalonia, Basque country*	
Portugal	moderate	good	
France	moderate	good	
Greece	moderate	moderate	
Italy	moderate	moderate	
Baltic states	low	moderate	Educational approach
Poland	low	moderate	
Hungary	low	moderate	LCA focussed (academia)
Czech Republic, Slovakia	low	low	
Romania	low	low	
Bulgaria	low	low	
Turkey	low	low	
Slovenia	low	low	

5.4.1 National - The Dutch model

Ecodesign has been on the agenda of the Dutch government and research institutes since the early 1990's. With its dense population and relatively small geographical size the Netherlands has had to take a top down approach to dealing with environmental issues in turn making them world leaders in many environmental areas. The Dutch government realised that the end of pipe solutions were not addressing the underlying problem and a new approach with solutions was needed.

[26] Final Report – Ecodesign ARC – Fraunhofer, 2005
[27] http://www.betterbydesign.org.nz/events/betterbydesign2005/presentations/futures/yrjosotamaa/
[28] Rector, Professor, University of Art & Design Helsinki, Finland
[29] Final Report – Ecodesign ARC – Fraunhofer, 2005

In collaboration with Delft and several other research institutes[30] the Ministry for Housing, Spatial Planning and the Environment (VROM) began research projects based on the eco-redesign of existing products. These were targeted at designing out the environmental impact of existing product. This 'pioneer phase' resulted in the development of tools and methods, which addressed the entire life cycle of a product. These were trialled in a range of industrial case studies and pilot projects.

From this initial phase several key lessons were learnt:

- Existing product redesigns can lead to a significant reduction of environment impact
- Inclusion of environmental tools and approaches (technically speaking) is relatively simple
- Successful ecodesign pilot projects are no guarantee that the approach is being integrated on a regular day-to-day basis.

This promising first phase fuelled governmental interest and resulted in financial and business incentives to increase industry involvement via ecodesign implementation projects. The next phase (1995-1999) was driven by a more pragmatic approach based on a business integration model.

During this period the emphasis was placed on the drivers required for companies to take ecodesign on board such as the opportunity to create greater customer values, higher product quality and cost reduction through more efficient design. This phase also presented a variety of key business lessons such as:[31]

- Eco designers must use the perceptions and opinions of all stakeholders in the environmental strategy not just that of the scientific LCA approach
- It is not only necessary to create new external values for ecodesign (higher profits, larger own market etc) it is important to take into account the interests of suppliers and end of life actors as well as added value for the internal company stakeholders involved
- POEMS (product orientated environmental management systems) can be a great way of transforming project wise ecodesign learning into a continuous and normal part of business operations
- The first priority of a company's product strategy should be to improve the environmental profile of those products that have a good value/cost position on the market, but relatively high eco-costs
- For most consumers, the quality and price filters are the first criteria when purchasing a product.

The Dutch have identified the need to go beyond the ecodesign of existing products and integration of environmental business models toward a strategy of substituting physical products with services, that is 'dematerialization'.

This has been the foundation for the current phase of ecodesign. When developed in a strategic way the gains in eco-efficiency of a product service system clearly outweigh those of the initial eco-product development model. In order to test this hypothesis a series of long-term societal experiments were set up together with Dutch companies, new entrepreneurs and research institutes in a special new organisation named Kathalys.[32] This project is now complete and resulted in a series of innovative projects such as the Mitka sustainable mobility project (Figure 7) and the office of the future.

[30] The Rathenau institute and TNO
[31] From Ecodesign of products to sustainable systems design: Delfts experiences – Brezet, 2001
[32] http://www.kathalys.com/

Although Governmental support for ecodesign activities in the Netherlands is not the same as it was in the nineties, the framework developed still exists, allowing progress in this area to continue. A more policy driven approach to ecodesign has resulted in stronger industry commitment with a handful of multinationals in the electronics and automotive sector collaborating with research institutes such as Delft TU leading the way.

Figure 7 The Kathalys Mitka project

5.4.2 National - The UK Model

In June of 2005 the UK Design Council published a scoping report on design and sustainability as a background to the Sustainable Design Forum in September 2005.

The UK Government Sustainable Development Strategy (2005) proposes that a Sustainable Design Forum will '*bring together expertise and educate in eco-design, and promote best practice tools and approaches which can be adopted by designers*' and to '*mainstream sustainability into product design*'.

The purpose of the scoping study was to sketch out a picture of sustainable design in the UK. It also aimed to identify opportunities for design offered by the sustainable development agenda, as well as policy approaches that could be used to accelerate progress.

A key finding of the report was that: progress has "*So far been incremental and responsive rather than radical and anticipatory. There are a number of possible explanations. Many aspects of the policy agenda are sector specific and have yet to filter through to impact on business, design and/or consumers. Financial incentives are currently too weak to summon a major design response and various 'technical exemptions' limit impact. The full weight of the government commitment to*

sustainable procurement has yet to be realised in the market"[33].

The key governmental departments driving the Sustainable Development Strategy are DEFRA (Department of Environment, Food, and Rural Affairs) and DTI (Department of Trade and Industry). They are involved with initiatives that impact on the design and production of sustainable products. According to the report three key elements of government policy will have positive influence over sustainable product design. These are; sustainable production and consumption, sustainable public procurement and product related policy.

The report concluded with a series of action based proposals for initiating and prototyping new sustainable design activities:

- Forum to promote best practice ecodesign tools and methods
- Factor 10 Forum[34]
- Design Led Sustainable Consumption Forum
- The Natural/Ecological Design Forum
- Demand creation for sustainable design
- Open source skills & learning portal
- Promoting new sustainable design service provision
- Mapping out the policy terrain

5.4.3 The Welsh initiative

While developing an ecodesign framework for New Zealand it is important to observe those countries that have recently begun an ecodesign initiative of their own. One such country is Wales, where the model for implementation is based on previously trialled projects and should be monitored carefully to highlight problems along the way.

The approach they have taken is based on the business case for sustainability. They have adopted an innovative and strategic model for implementation based on international best practice, effectively leapfrogging many of the trial and error projects undertaken in the past 10-15 years.

A national ecodesign initiative for small and medium-sized enterprises (SME's) has been proposed to provide a structured approach of engaging and enabling these stakeholders. Design Wales were commissioned to work on Stage 1 of the initiative, seeking to establish international best practice, along with developing a number of models for implementation.[35]

The first six months of stage one concluded in 2004 and established international best practise enabling Design Wales to develop an a national initiative 'fit' for Wales using a life cycle team approach. The proposed model for the Welsh ecodesign initiative is now in a refinement process and due to be presented in early 2006.

[33] 'Design & Sustainability – A Scoping Report' – Design Council (June 2005)
[34] To champion radical innovation in sustainable design to deliver factor 10 gains in resource and energy efficiency
[35] Developing an ecodesign initiative in Wales – O'Rafferty, 2004

5.5 Networks

When considering ecodesign in the EU context it is important to realise that cross sector discussions develop through a series of informal and formal networks. These networks are generally sector orientated with few covering a wider spectrum. The network sectors range from academic, design, business and policy, many of which have originated within the EU, or are exclusive to the EU.

An effective ecodesign network[36] is driven by common goals where participants from diverse backgrounds encourage each other to learn from other sectors. A good example would be the Suspronet[37] thematic network of industries and institutes under the EU Fifth Framework Programme. Suspronet developed and exchanged expertise on design of product-service systems for sustainable competitive growth. Concluding in late 2004, key Suspronet tools were expert databases, and a collection of resources on product service systems.

5.5.1 O2 Global Network of Sustainable Designers

O2 is one of only a few full spectrum sustainable product design networks. Originally formed in the late eighties, O2 is an informal network for anybody interested in sustainable design. The network is made up of individuals, local groups, and coordinating liaisons from all over the world. It is largely driven from an Internet user group and email list. The current membership is around 950 people.

Several groups such as O2 UK[38] and O2 USA Bay Area have grown substantially but by far the largest and most influential group is O2 Netherlands. Their members are from a variety of sectors, including designers, architects, academics and engineers. They convene on a monthly basis to talk on a given subject or resolve a particular issue relating to sustainable design.

In the past, O2 Netherlands has held several workshops given lectures and organized events. The way in which an 02 group is organized and what it does is up to them, with the goal being to communicate and share their ideas with other groups and liaisons using the international mailing list.

New Zealand has two 02 liaisons, Martin Sidoruk and Timothy Allan under which a strategy for forming a group and website is currently being developed.

5.5.2 The Natural Step

The Natural Step (TNS)[39] is an international non-profit organization that has been working since 1988 to accelerate global sustainability. TNS provides a strategic framework for sustainability. This tool is a clear, conceptual framework that explains the ‘why’ and ‘how’ of a long-term vision for a truly sustainable society. The Natural Step Framework has been applied to businesses, non-profit organisations and community projects.

Although they are not a product design orientated organisation their framework model supports and encourages product development, which has a reduced environmental and social impact.

In New Zealand the TNS[40] have been operating since 1997, working with large and small businesses, local and regional authorities and other organisations to create

[36] Full spectrum or sector orientated
[37] http://www.suspronet.org/fs_suspronet.htm
[38] www.o2uk.org
[39] http://www.naturalstep.org
[40] http://www.tns.org.nz

solutions designed to accelerate the transition to a sustainable future.

5.5.3 Multi-stakeholder networks

Although these full spectrum networks are highly important, it is the influence of industry and research institute driven networks that have had the greatest influence on ecodesign developments. The type of network and results can vary greatly depending on the stakeholders involved and the desired outcomes of the collaboration. Three good examples of these are

- **The Ecolife thematic network**[41]
- **IEEP - The Indian European Ecodesign Program (IEEP).**[42]
- **Prepare - PREPARE (Preventive Environmental Protection Approaches in Europe)**[43].

5.5.4 The role of networking in the NZ context

Whether in the EU or New Zealand context it is important to realise the role networking plays in the development of ecodesign. For New Zealand to make strategic moves towards an ecodesign initiative, both national and international networks need to be established. Nationally, networks can raise awareness among sectors and provide information. Internationally, networks can stimulate new ideas and help New Zealand keep up with developments world wide.

[41] http://www.ihrt.tuwien.ac.at/sat/base/EcolifeII/index.htm
[42] http://go.to/sustainabledesign
[43] http://www.prepare-net.org/index.html

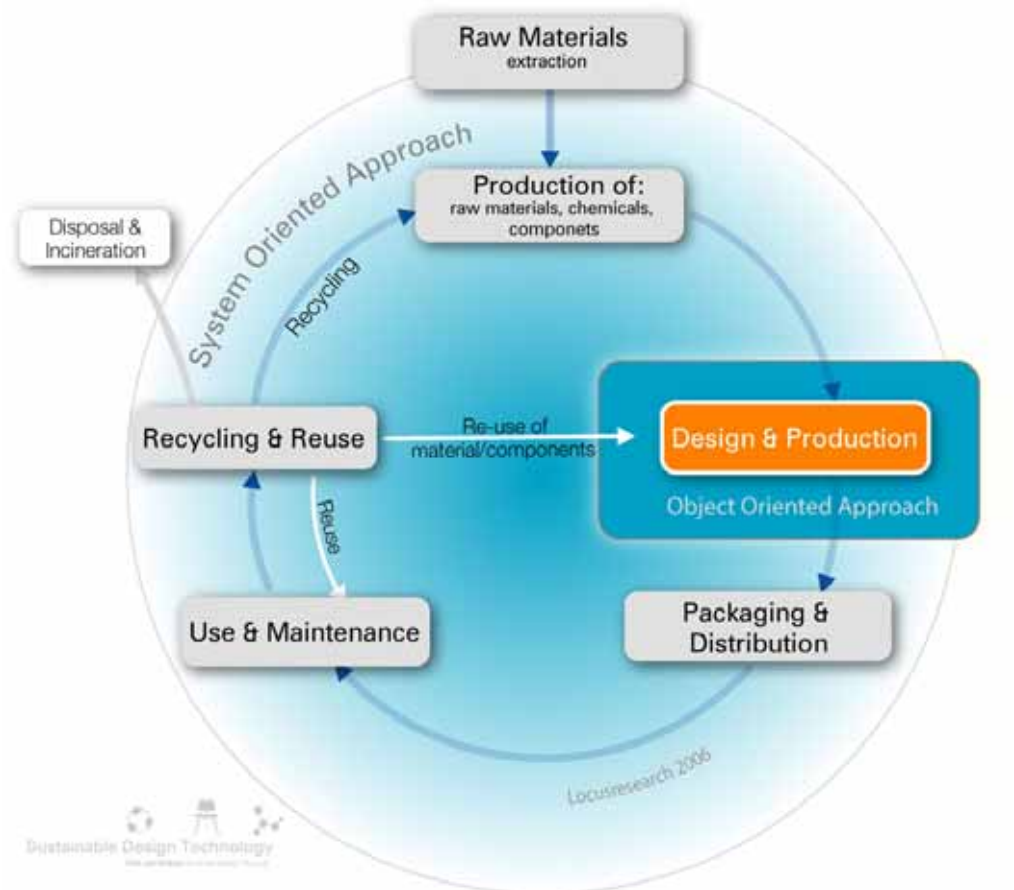
6 Applying Ecodesign

This section discusses how ecodesign is actually applied in a commercial setting using the generalised concepts that have developed out of Europe. It covers the basic intent, strategy and tool selection process as well as the tools, methods and guidelines themselves.

Businesses using sustainable practice in product development in the EU have predominantly focused on ecodesign. It is also where most funded research projects and real life applications of sustainability have occurred in the EU context. Consequently the ecodesign process has become highly resolved and clearly defined. This does not indicate that it has become mainstream yet, rather that the tools and methods have become available through numerous applications and ongoing research.

Since the early 90's, collaborative pilot projects between industry and research institutes have experimented with new tools and methodologies for ecodesign. The foundation for this is 'life cycle thinking'. This means analysing a product across its entire lifecycle not just the design and manufacture. In other words taking a 'system' rather than an 'Object' oriented approach.

Figure 8 Life Cycle Thinking[44]



Several design process models have been created using a step-by-step method, such as those used in traditional product design, to guide the product development process. For example one of these is the ISO/TR 14062 model[45]. These models provide a range of generic strategies to help guide ecodesign and develop tasks along the product development process.

[44] Diagram by Locus Research based on PlanMiljo & Fraunhofer
[45] Refer to table in Appendix 3

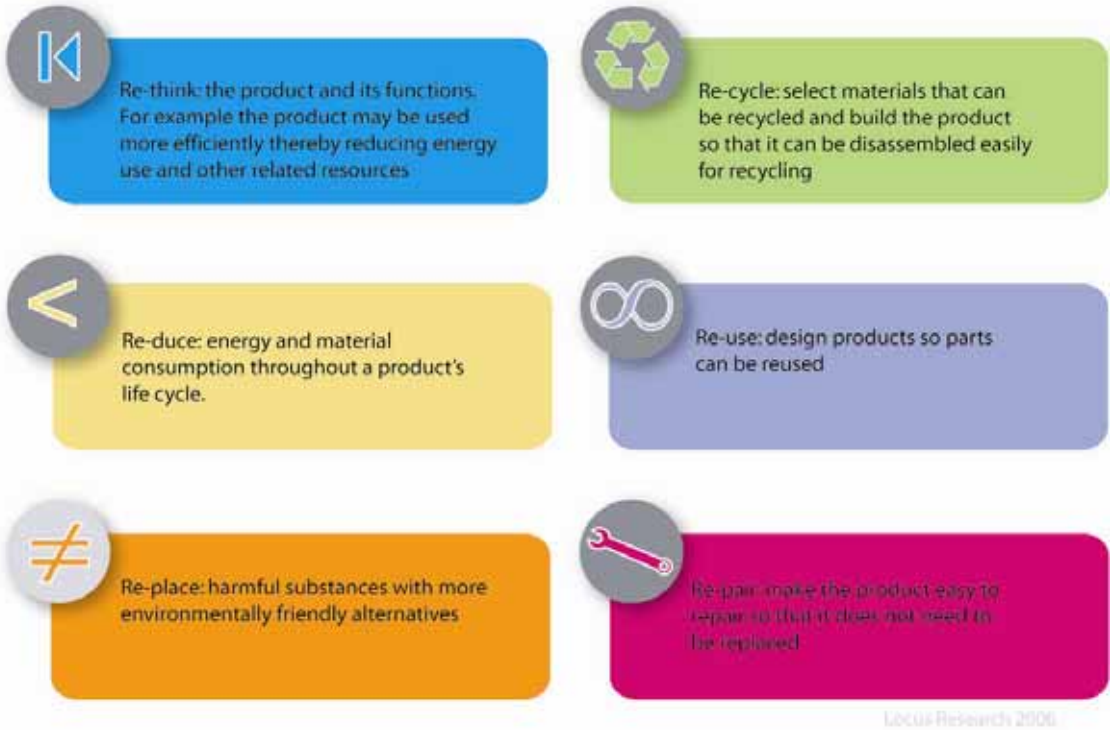
6.1 Ecodesign & Lifecycle thinking

Life cycle thinking or the 'cradle to grave' or the 'cradle to cradle' approach pioneered by Michael Braungart and William McDonough is a fundamental concept to ecodesign. Such thinking can assist in identifying the critical life cycle stages and reducing their impact. It espouses a move away from 'object' to a 'system' orientated model. Figure 8 is a generic view of 'Life Cycle Thinking' and illustrates the inclusion of the system of producing a product as well as its entire life cycle. This represents a paradigm change for a designer that requires careful education.

The key goal of ecodesign is to reduce the environmental impact of a product throughout its life cycle with emphasis on those life cycle stages that have the greatest environmental impact. For instance a washing machines major impact is during use (it uses water, detergent and energy) whereas an office chair is during manufacture (as it uses no energy or water during use). Understanding and addressing the high impact life cycle stages of a specific product category enables the greatest impact reduction.

Life cycle thinking is based on the principles of the pollution prevention where the environmental impacts are reduced at the source. Source reduction is then equivalent to what may be referred to as the '6RE philosophy'[46] illustrated in Figure 9.

Figure 9 The 6RE philosophy



6.2 The four types of Ecodesign[47]

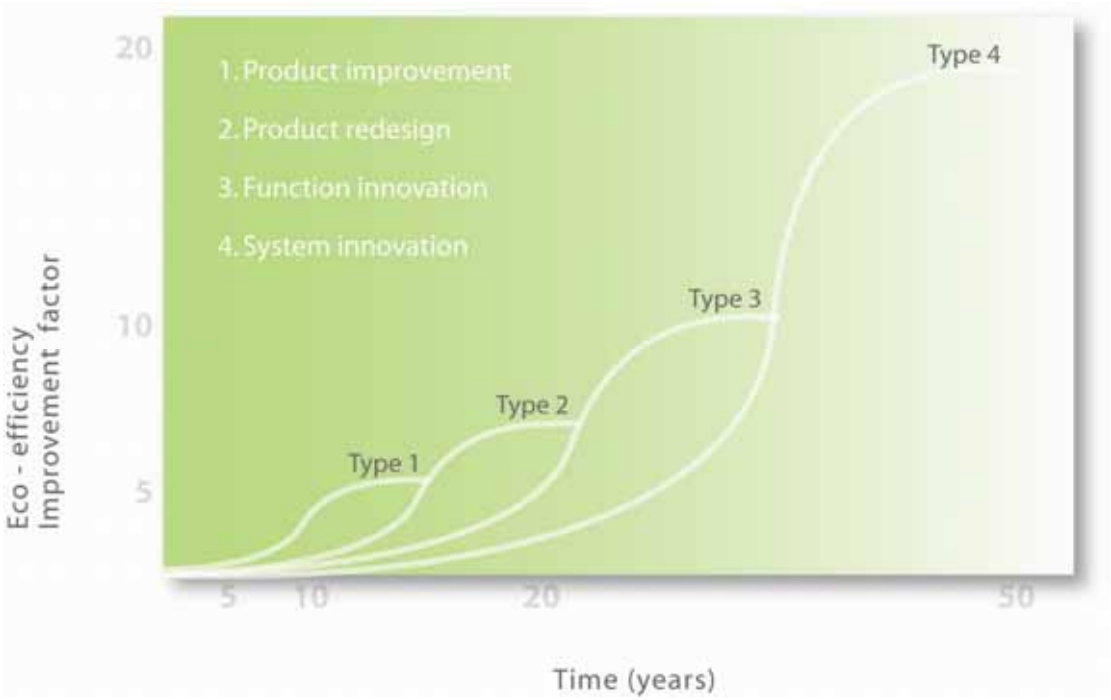
'Efforts to introduce ecodesign (understood in the broad sense) can be divided into four types.'[48] These are dependant on the levels or 'Eco-efficiency Improvement Factors' that are sought. These are illustrated in Figure 10.

Type 1: Product improvement: Partial changes and environmental improvements to products that already exist on the market

[46] UNEP Guide to Life Cycle Management – Final Report 2004
[47] Summarised from Han Brezet (1998; Rathenau Institute 1996)
[48] "Sustainable Solutions" – Martin Charter & Ursula Tischner, 2001

Type 2: Product redesign: Although the existing product concept stays the same the components of the product are fully improved or replaced
Type 3: Function innovation: Is not restricted to the existing product concept. In this case the way the function is fulfilled is changed
Type 4: System innovation: The entire technological system (product, production chain and associated infrastructure and institutional infrastructure) is replaced by a new system.

Figure 10 Four Types of Ecodesign[49]



This diagram can also be used as an introduction to companies approaching ecodesign for the first time. It gives them an insight into the pathway they can follow and could provide a guide as to what 'Type' of approach to use. It is likely that companies would start with Type 1 (product improvement) and evolve themselves to the stage of being able to undertake a Type 4 (system innovation) project.

6.3 The ecodesign process

The product development process varies enormously between organizations. In practice, companies use a combination of approaches and tools for their development process. Accordingly, a standard approach to integrate environmental aspects into product development is not feasible.[50]

However, there are several generic ecodesign models based on the traditional step-by-step or stage approach. Two good examples of these would be the ISO/TR 14062[51] model and the UNEP Ecodesign manual, which consists of seven steps:

1. Organising the ecodesign project
2. Selecting a product
3. Establishing the ecodesign strategy
4. Generating and selecting ideas
5. Detailing the concept
6. Communicating and launching the product
7. Establishing follow up activities

[49] Han Brezet, 1996
[50] Ecodesign guide, 2002
[51] See appendix 3

6.4 Ecodesign strategies

An ecodesign strategy provides guidance for the development of tasks, targeting the reduction in the environmental impact. The correct selection of strategies is important to the success of the ecodesign. Figure 11 shows eight generic strategies, and within them the specific strategies. It also relates these to the where it is most likely beneficial to apply these strategies within the product life cycle. This enables the accurate selection of a strategy according to the highest impact life cycle stage of a given product context.

Figure 11 Ecodesign strategies and Life Cycle Relations [52]

	Generic strategies	Specific strategies
-	1 New concept development	Dematerialization Shared use of the product Integration of functions Functional optimization of the product (components)
Product component level	2 Selection of low impact materials	Cleaner materials Renewable materials Lower energy content materials Recycled materials Recyclable materials
	3 Reduction of materials usage	Reduction in weight Reduction in (transport) volume
Product structure level	4 Optimization of production techniques	Alternative production techniques Fewer production steps Lower/cleaner energy consumption Less production waste Fewer/cleaner production consumables
	5 Optimization of distribution system	Less/cleaner/reusable packaging Energy-efficient transport mode Energy-efficient logistics
	6 Reduction of impact during use	Lower energy consumption Cleaner energy source Fewer consumables needs Cleaner consumables No waste of energy/consumables
Product system level	7 Optimization of initial lifetime	Reliability and durability Easier maintenance and repair Modular product structure Classic design Strong product user relation
	8 Reduction of end of life system	Reduction in weight Reduction in (transport) volume

[52] Locus reproduction from the UNEP/promise manual (Brezet and Hemel 1997)

6.5 Ecodesign Tools [53]

There are many ecodesign tools from simple, manual tools to complex quantitative software. The selection of the best tool for a given project depends on the needs and knowledge of the user, and the degree of improvement sought. Ecodesign tools predominantly target problem identification, rather than solution creation.

The simplest classification of tools is into those which perform analysis and those which are aimed at improvement. Analysis tools provide a measurement of the potential environmental impact of a product. They may be used to benchmark a previous product or that of a competitor. Alternatively, they may be used at the end of a design project to validate the product's impact. Whereas improvement tools, on the other hand, are used during the design process to direct activity and provide information on the process.[54]

A couple of examples of commonly used tools for analysis include life cycle assessment (LCA), materials, energy, toxicity (MET) matrix and, Ecodesign pilot[55], LCA is predominantly a software-based application, which requires some scientific and methodological knowledge. The MET Matrix is a qualitative method of organising all the types of environmental problems that a product system produces throughout its life cycle. Ecodesign pilot is a simple and informative internet based analysis tool.

The 'Tespi' tool (refer to Appendix 1: In depth case studies), developed in conjunction with the Ecosmes initiative, is a good example of an improvement tool. It not only addresses the environmental improvement options for the product design but also enables analysis and trade offs against key consumer factors and variables. This multi faceted approach is evidence of the new types of tools coming onto the market that acknowledge the importance of reviewing the environmental information in the context of the product requirements.

Figure 12 is a summary of some of the key types of tools that are available. Effort has been made to list different 'types' of tools, as a result LCA is compiled into a single line as there are a huge variety of tools both full and abridged that can be utilised, but they all operate off the standardised method.

Figure 12 identifies whether they are a tool, software, a method or a guideline. The figure also establishes 'who' can practically use the tool or information from the tool in order to create a ranked list. The rating scale is an exponential scale of 9, very relevant to the group, 3 partly relevant, 1 little relevance or 0 no relevance. This enables tools to be ranked approximately according to their relevance to an organisation as a whole.

The two highest scoring tools have been drawn out and summarised in Appendix 9: LiDS wheels and MET matrix. These tools are manual tools that can be used by a wide variety of people to start the ecodesign process.

[53] Wherever the word 'tools' (unless stated otherwise) is used it will refer to the amalgamation of software tools, template tools, checklists, matrix, manuals and guidelines.
[54] Ecodesign guide, 2002
[55] Online software tool

Figure 12 Ecodesign Tools

Ecodesign Tools	Category				User Group				
	Software Tool	Tool	Method	Guideline	Executive/manager	Product Developer	Researcher/Scientist	Total	Comment
LiDS wheel		Yes	Yes		9	9	9	27	Life Cycle Design Strategies (LiDS)
MET matrix		Yes	Yes		9	9	9	27	Material Energy Toxicity (MET) Matrix
UNEP manual				Yes	3	9	9	21	Ecodesign Guideline
Ecodesign checklist		Yes		Yes	9	9	3	21	Strategy Checklist
Tespi	Yes				3	9	9	21	EU Online Quality and Ecodesign tool
Eco-portfolio matrix		Yes	Yes		9	9	1	19	Analysing Market & Eco Factors together
Ecodesign priority matrix		Yes	Yes		9	9	1	19	Prioritises Ecodesign Options (Cost/Benefit)
The Strategy list				Yes	9	9	1	19	High Level Product Development Strategy worksheet
Ecodesign health check	Yes				9	9	0	18	Basic Online Product Analysis
Ecologicad	Yes		Yes		9	9	0	18	Engineering Orientated LCA Tool integrates with ProEngineer
PIT Tool		Yes	Yes	Yes	3	9	3	15	Product Improvement Triangle - Identifies improvement options
Idemat	Yes				3	9	1	13	Material Specification Tool
Ecodesign pilot	Yes			Yes	0	9	3	12	Online Ecodesign Tool
EDT-Supply chain module	Yes			Yes	9	3	0	12	EU Policy Compliance Tool
DMFA	Yes		Yes		3	9	0	12	Design for Manufacture & Assembly
IoEA		Yes	Yes		1	1	9	11	Impacts or Environmental Aspects (ISO14001)
LCA	Yes	Yes	Yes		0	1	9	10	Life Cycle Assessment : There are many tools
A practical manual of ecodesign				Yes	0	9	0	9	Spanish Eco-Design Guide based on Eco-Indicator
Merge	Yes				0	9	0	9	Software Tool for Designers (design guides)
LCC	Yes	Yes	Yes		3	1	1	5	Life Cycle Costing/Total Cost Accounting (TCAce or Gabi)
Total					100	150	68		

Definition of Categories	
Software Tool	Is defined by being a standalone software application that provides results from its use.
Tool	Is defined by being a manual tool that can be replicated using a template 'Tool applies broadly to a device that facilitates work'
Method	Is defined by being an established and accepted methodology 'A means or manner of procedure, especially a regular and systematic way of accomplishing something'
Guideline	A statement or other indication of policy or procedure by which to determine a course of action

6.6 Summary of applying Ecodesign

The ecodesign process is supported by a set of strategies, which provide guidance for the development of tasks. These have a direct relationship with the lifecycle stages of the product and can be used to effectively influence those phases with the greatest impact. Appreciating the different strategies also helps to emphasise the importance of ecodesign being built into the product design process rather than addressed separately.

There are many tools to aid with the ecodesign of products. These address all the product development stages. Simple tools that are able to communicate and improve understanding across a wide range of internal stakeholders are likely to be particularly effective in business.

7 The Reality

From the outset it has been claimed in the EU context that the adoption of ecodesign would lead to product improvement and competitive advantage. After more than 15 years of development the benefits still remain unclear[56]. This section investigates some of the positive and negative aspects of the real life application of ecodesign within Europe.

Successful ecodesign implementation has not taken off to the extent that was initially predicted (What happened to the ecodesign boom?). A clear gap exists between the research development of the past 15 years and the commercial implementation.

7.1 After 15 years of Ecodesign where are the Eco-products?

Ecodesign research and development and the needs of existing business activity appear to have been misaligned. This can be attributed to several factors such as the academic research focus on complex tool development. Some of the key issues are evaluated by sector, and then the drivers and barriers summarised.

A range of case studies has also been included in the appendix to help illustrate ecodesign in practice. These have been broken into 4 depth studies (Appendix 1: In depth case studies), and a compilation of 10 short but interesting products (Appendix 2: Compilation of short case studies).

7.1.1 The Education Sector

Ecodesign is still a relatively new addition to the standard product design process, with teaching ecodesign at a tertiary level only emerging in the 1990's. As a result the most effective approach for incorporating ecodesign into a traditional curriculum is still being defined.

Engineering, design engineering and industrial design schools worldwide are developing tertiary courses to teach applied ecodesign with mixed results. The challenge is not only teaching the students but also the teachers how to integrate the topic into a regular product development process.

Overcoming this educational barrier has been on the agenda for over a decade at Delft. There have been several phases over this duration with both positive and negative results. A lot can be learned from this initial period and used to develop effective curriculum models for tertiary institutes. Some of the key conclusions from Delfts experiences have been summarised:

- A top down approach to training lecturers is counterproductive
- All lecturers will have to grasp and integrate the concept of sustainability into their courses
- Integration of sustainability into existing courses is not a spontaneous process
- Introduction of a separate course on sustainability will initially be essential but not sufficient.
- Ecodesign is a cross functional subject and collides with traditional organisational structures

[56] Measuring implementation and performance of Ecodesign in the electronics sector – Boks, Pascual & Stevels, 2003

It is critical that ecodesign education at a tertiary level is strategically applied. This will effectively develop a bottom up approach to sustainable design within industry and prepare the next generation for a professional career where they are effective, sustainable designers.

7.1.2 The Research Sector

Ecodesign has been a research-orientated activity. In the past decade industry has supported research initiatives with enough data to keep the research going but has not been proactive in supplying creativity and ideas[57]. The research projects have been driven by funding rather than real industry or market need.

Although in recent years the level of collaboration between industry and research institutes has improved due to new environmental policy requirements there are still a range of issues that could be resolved. These are outline in Table 4.

Table 4 Research & Industry Collaboration Issues

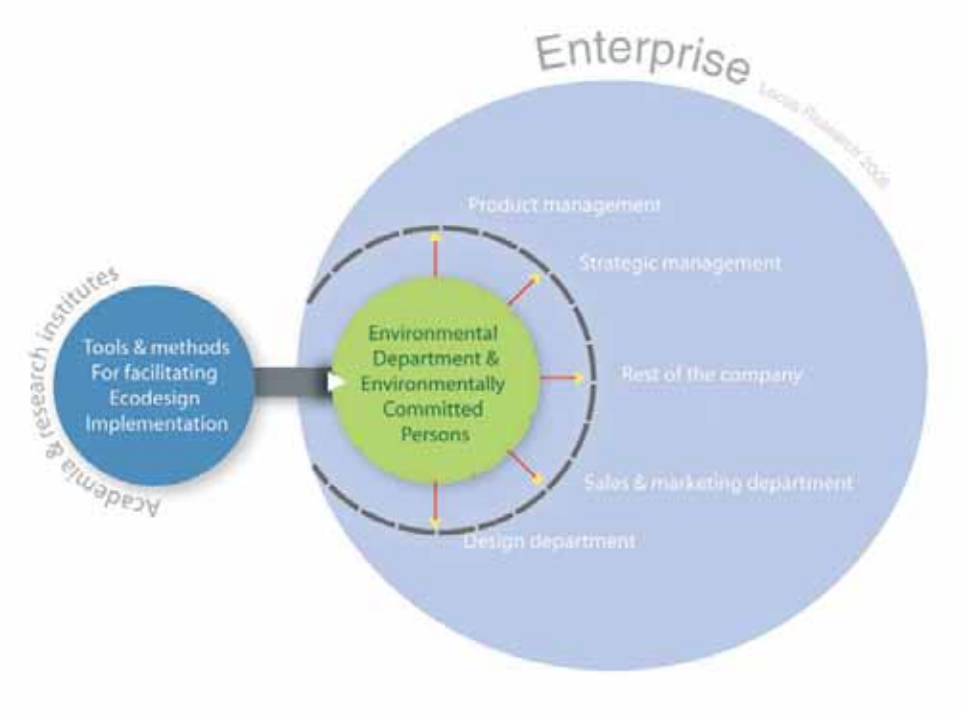
- **Lack of follow up activities after a pilot project:** successful projects highlight the potential of the tools and methods but often cease to be used on a day to day basis due to lack of support
- **Lack of research into ecodesign integration:** emphasis on Ecodesign process rather than alignment of ecodesign within business operation
- **An excessive focus on complex tool development:** emphasis in research institutes to develop new tools and methods, more attention needs to be placed on the actual implementation of the tools and methods being developed
- **Tool selection rather tool development:** large reservoir of tools has confused companies trying to decide how to implement ecodesign. Tool selection procedure should be addressed to ensure companies select the most relevant tool
- **Communication of knowledge:** information produced by research institutes is of a very scientific and high-level nature making communication difficult within businesses
- **Problem not solution focussed:** research effort is focused on 'problem identification' rather than 'solution creation'
- **Teaching and training does not mean implementation:** teaching and training of ecodesign to a select number of people within a company does not guarantee further dissemination of information throughout an organisation.

A key concept that has emerged from the EU development of ecodesign is that teaching the environmental department within an organisation does not mean that it will be communicated to the other stakeholders. This can be attributed to the following factors:

- **Unclear process of communication** of results to other internal stakeholders
- **Communication** should be handled by staff skilled in communication, rather than environmental specialists (or better tools chosen)
- **Ecodesign language is not understood** by other stakeholders
- The **environmental team is not fully integrated** with other departments
- Big **difference between knowing it and doing it**.

[57] How research institutes can contribute towards research progress in true operationlisation of ecodesign - Boks, 2003

Figure 13 Teaching versus Implementation development of Boks, 2003



There is a big gap between the tools and methods developed for ecodesign in research institutes and those actually applied in industry. It is however important to acknowledge the involvement of both research and industry and it is important that '*alignment of interests should be done from both sides*'[58]

7.1.3 The Industry Sector

On an industrial level there are relatively few examples of eco-products on the market to support the amount of research and development in this area. This slow uptake can be attributed to issues including a lack of stakeholder incentives and the perceived extra cost. The key barriers for the industry sector are expanded on in the drivers and barriers section.

Essential company conditions that will have an effect on the success of ecodesign applications in an organisation include:

- Organisational culture
- Business conditions such as profitability and market share
- Influence exerted by external stakeholders
- The degree of freedom provided internally for ecodesign
- Whether environmental issues can be used to gain a competitive edge

In Table 5 there are a range of industry factors that are localised to the EU and have an effect on the uptake of ecodesign. These range from the impact of environmental policy to the lack of available information on ecodesign.

[58] How research institutes can contribute towards research progress in true operationlisation of ecodesign - Boks, 2003

Table 5 EU Industry factors

- **The Effects of EU environmental policy**[59]: has had a major impact on how products are developed and brought to market.
- **The policy driven approach** has meant that ecodesign has become an incremental policy compliance issue predominantly related to end-of-life rather than taking a holistic life cycle perspective to ecodesign.
- **Alignment of ecodesign with business operations:** ecodesign has focussed on product design and environmental sciences and not on business integration.
- **Profit:** "Change through market-driven innovation is the type of change our society understands best. …The challenge today is to develop sustainable business that is compatible with the current economic reality. Innovative business models and products must work financially, or it won't matter how good they are ecologically and socially"[60]
- **A strong focus on end of life issues:** end of life issues stemming from the end of pipe era are still evident in current policy such as WEEE. This perspective limits the true potential of both the environmental and economic aspects of ecodesign. Issues such as energy consumption of products will need to be addressed with greater rigor in the future due to international agreements such as Kyoto.
- **Companies need tailor make solutions**: tools developed by research institutes for industry applications are often too generic. The customisation of tools is necessary for their continued use.
- **No universal language for ecodesign communication**- the language of ecodesign is of a scientific nature. Being able to clearly relay this information throughout an organisation with common language will be critical to its further integration with in a company.
- **A few front running companies** - but on the shelf examples of eco-products are still few and far between.
- **Stakeholder's incentives are still relatively low**- although increasing political pressure has been a key driver for the adoption of ecodesign by industry; incentives from other stakeholders such as consumers are less evident.
- **A lack of available information** – there is a lack of accessible information for both raising awareness and informing companies of how to implement ecodesign.
- **The complexity & diversity of tools for ecodesign** has made their actual use and selection for a particular task difficult.

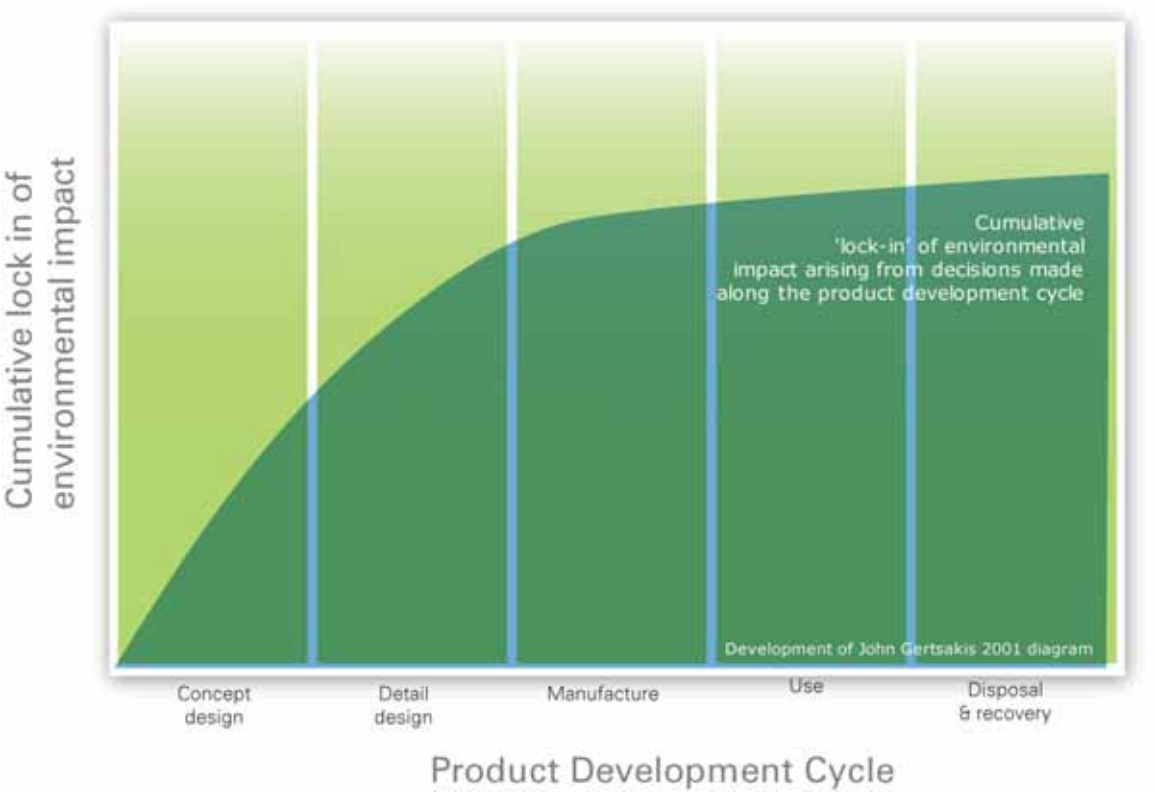
7.1.4 Ecodesign & Industrial Design

Ecodesign has predominantly been a technically oriented activity conducted by researchers that are not themselves designers or design engineers. This has been detrimental to the uptake of ecodesign by industrial designers and this has created a semantic gap between ecodesign tools and design practice.

Designers can perhaps play a more pivotal role in reducing the environmental impact of a product at the front end of a project with a conceptual and strategic focus. This is supported by the fact that most of the environmental impact of a product is 'locked-in' at the research and concept development stage. Industrial design can affect impacts prior to the detail design stage. Figure 14 shows the cumulative lock in of environmental impact in the context of the product development cycle. Clearly ecodesign is a critical part and if the industrial designer helps establish the brief at an early stage, he/she can create real impact.

[59] Please refer to appendix for a detailed overview of the key EU directives and policies.
[60] Innovating our way to the next industrial revolution - EPD report, 2001

Figure 14 Cumulative Lock-In of Environmental Impact (Gertsakis)



7.2 Drivers & Barriers

The main barriers to the uptake of ecodesign can be reduced down to the perception it will add time and cost, without delivering benefit. Other key barriers exist between the academic and research sectors that participate in researching and developing new tools and techniques and the enterprises that utilise them in the commercial domain.

In the EU one of the critical drivers has been the development of central government policy and subsequent funding to assist companies to achieve compliance. This has had wide-ranging impacts on the development of ecodesign within the EU but also created some barriers as a by-product of this process.

Drivers such as efficiency and reduction have been fairly widely utilised in industry, whilst the more 'constructive' benefits such as increased innovation, market acceptance, and the advantages of a systems perspective have been less widely used. This highlights the need for the business integration model of ecodesign where all company departments are involved in its implementation rather than just the environmental group within an organisation.

7.2.1 Barriers

The most apparent barrier to the uptake to ecodesign is the general perception that it is a specialised area of design requiring additional time and money, rather than an integrated part of development that can result in a variety of business benefits.
The main barriers that have been noted in research on ecodesign applications in both the SME and multinational sectors are as follows:

- Lack of available information
- Creating awareness and finding relevant information
- Lack of incentives from all stakeholders

- Perceived extra costs (time and money)
- Language gap
- Low incentives
- Poor alignment with business operations
- Few examples of eco-products

There is a causal linkage between the policy driven and government funded approach that has operated in the EU to the potential disjuncture between ecodesign research and industry/enterprise applications of ecodesign. Essentially the practical implementation into mainstream enterprise has lagged behind the development of new tools, processes and ideas. With this, there is a very real risk that the developers lose touch with the pragmatics of application and also weaken the critical feedback loops needed to refine ideas in practice. For this reason it is important to realise the need for a collaborative approach to ecodesign projects rather than one sector leading the way.

Some of the research applications also exist in large enterprise, which have limited relevance or use within the SME context.

7.2.2 Drivers

In the case of the European SME sector the two broad drivers are legislative compliance and perceived economic benefit. These can be divided into internal and external drivers, with some occurring in both, such as 'reduced environmental impact.

Table 6 Internal & External Drivers[61] (please refer to appendix 7)

Internal drivers

- Need for increased product quality
- Image improvement
- Need to reduce costs
- Increase cost efficiency
- Increase and/or stimulate innovation
- Employee motivation
- A sense of responsibility
- Reduce environmental impact
- Gain a systems perspective
- Improve supply chain

External drivers

- Reduce environmental impact
- Decrease risk of liability (Short & Long Term)
- Government Directives and policies
- Attract customers
- Market demand/competition
- Trade/industrial organisations
- Waste charges
- Environmental requirements for design awards
- Improve supply chain

Currently the understanding of benefits for ecodesign from all stakeholders is relatively limited. Pending legislative requirements represent one of the few tangible and pressing reasons for a company to take an ecodesign approach. This underlines the need for the ecodesign business case in both the short and long term to be

[61] DFE guide – National Research Council, Canada, 2000 & Ecodesign Awareness Raising Campaign (EC), 2005

emphasised.

Ecodesign offers business an opportunity to enhance environmental performance, while simultaneously improving their bottom line. Companies that apply ecodesign find that it can have a variety of short-term benefits such as[62]:

- Reduces environmental impact of products/processes
- Optimises raw material consumption and energy use
- Improves waste management / pollution prevention systems
- Encourages good design and drives innovation
- Cuts costs
- Increases product marketability

Ecodesign can also provide a means for establishing a long-term strategic vision of a company's future products and operations. In general, ecodesign can be an enabling force to shape more sustainable patterns of production and consumption.

7.3 Ecodesign Trends

To interpret where ecodesign is going, the current status also needs to be defined. So this section is divided into 'current' and 'future'. These trends have been compiled from the research, expert interviews, and a range of resource information. They can only be qualitative but provide an idea of the current status and future direction.

7.3.1 Current Trends

With a relatively small market share eco-products are hard to find. Case studies chosen for this report are representative of eco-products across the board and highlight some of the key focal areas of ecodesign. Under the category headings below four products have been reviewed in detail.[63]

- Environmental technologies
- Ecodesign and biomaterials
- Supply chain
- Quality and compliance

In December of 2005 the European Conference was held under the Marrakech-Process[64]on sustainable production and consumption (UNEP). The results from the conference concluded the key issues on ecodesign and life cycle thinking.

- **Governments**: Lack of a coherency, lack of mechanism to set minimum standards for non-EuP, need for engagement at global level.
- **Business - supply chain:** lack of data and transparency, lack of commitment all the way down the supply chain.
- **SME's:** lack of awareness, knowledge, capacity, and incentives.
- **Retailers:** lack of responsibility for the sustainability of products they sell.
- **Consumers:** Persistence of markets for unsustainable products**,** passivity of consumers, negative perceptions, lack of interest and tools to act

Other points that need to be highlighted about where ecodesign is now are:

- Many businesses are beginning to adopt an EMS (environmental management system) such as ISO 14001 to take account of product related environmental issues.
- Most product environmental improvements are incremental or based on

[62] DFE guide and ARC campaign in appendix 6 & 7
[63] Case studies in appendix 1 & 2
[64] UNEP 10 year framework on production and consumption

redesigns with little radical innovation.[65]

- There is a focus on policy compliance and design for end of life rather than wider life cycle considerations.
- Initial phases of ecodesign are technically and engineering oriented with organisational implications largely taking a back seat.
- Companies are still struggling to present the internal business case for ecodesign and winning over middle management.
- Design engineers tend to be doing ecodesign within industry.
- Product designers are generally not involved with ecodesign within industry.
- Dematerialization in the form of 'product service systems' is gaining popularity.
- Within the academic arena there is a clear trend to showing a move from ecodesign to sustainable design research.
- In the industry sector sustainability has been reflected through corporate social responsibility (CSR) rather than sustainable product design.

7.3.2 Future Trends

This forecasting exercise is a result of the research undertaken by the author and compiles the opinions and thoughts of experts from Europe. It looks forward based on the emerging trends and current progress within the EU.

Ecodesign is likely to become more widely accepted as essential to industry, consumers and government. Ecodesign will migrate to become 'sustainable product design' incorporating social factors. Wider use of tools within industry will see them become more effective for day-to-day application.

The key trends in ecodesign forecasting into the future are:

- Greater acceptance of 'sustainable product design' into the mainstream.
- Further growth of 'product service systems' and a move away from object oriented design to systems oriented design.
- Development of simple but not simplistic tools to analyse and enable sustainability impacts and improvements
- An increase in companies developing their own 'closed loop' systems
- Wider implementation of environmental management systems to enable enterprise to become more sustainable creating a better platform to inform & enable ecodesign.
- Environmental policy and legislation moving beyond electronic and automotive sectors into most product sectors.
- There will be a growing interest in low carbon technologies and energy reduction in use.
- A focus on products to reduce the consumption of water.

[65] Ten years of sustainable product development and design presentation by Martin Charter at Sustainable innovation 05

8 The New Zealand Context

8.1 Alignment with the European Model

The EU model of ecodesign will not perfectly align with the New Zealand context, but there are valuable lessons to learn. This section attempts to overlay important findings of the EU context to summarise them for application in New Zealand.

Ecodesign within NZ is positioned where Europe was 10 years ago but can effectively 'leapfrog' the majority of those trial and error years and is in a good position to learn from the mistakes made in that time. The flow of information internationally has also increased significantly enabling rapid dissemination of new ideas.

8.2 Changing Stereotypes

The general perception of ecodesign in New Zealand (and probably further a field) may be based on a stereotype represented by products that are low technology and are effectively end of pipe product ideas. It is also characterised by the perception that it adds cost without adding value.

To develop ecodesign in New Zealand these stereotypes need to be changed. Ecodesign should be seen as a high technology value added process that can deliver tangible benefit to enterprise. It should produce products where the entire life cycle is considered and the ecodesign process is conducted in a robust and objective manner that is supported in an integrated way by business.

Figure 15 Changing Stereotypes

Whilst the evidence of ecodesign in New Zealand is limited there is a growing commitment within industry and the professional design community to address the issue meaningfully. Some of reasons for the late acceptance and integration of ecodesign by the New Zealand academic, design and industry sectors may be:

- The lack of urgency
- Lack of awareness
- Perceived stereotype
- Lack of drivers
- The notion of being green already
- Mindset of industry
- Limited accessible knowledge
- No New Zealand specific/relevant data
- Infrastructure is not compatible

8.3 Implementing Ecodesign

To implement ecodesign within New Zealand a foundation needs to be laid. This could occur in two phases that would be targeted at the primary stakeholder groups. Phase 1 would ideally be an awareness raising campaign targeting the four stakeholders would create the platform to implement ecodesign within business, design, academia, and the public domain. Phase 2 would focus on implementing ecodesign within the stakeholder groups.

Table 7 NZ ecodesign implementation

Phase 1	Raising the awareness of ecodesign
Target Group	Industry Professional Designers Academics General Public
Phase 2	Implementing ecodesign
Target Group	Industry Professional Designers Academics

Prior to the development of toolboxes for the industry, design and academic sectors there should be further work conducted into how best to deal with integration. This approach will avoid the over reliance on end of life, compliance and incremental ecodesign work, and instead enable organisations as a whole. Any 'pilot projects' should focus on enabling an organisation to get into the position to effectively use ecodesign strategies and tools, rather than that of a specific product.

Key components of potential sector toolboxes could be:

Academic
- Teaching the teachers
- Sustainability in the curriculum development
- Simple tools
- Hands on training
- Recommended reading list

Design professionals
- Specific tools
- Manuals
- Strategies
- Simplified LCA
- Policy & legislation

Industry
- Environmental management systems
- Strategies
- Supply chain management
- CSR
- Green marketing
- Policy & legislation

8.4 Identifying the Key Organizations in New Zealand

Within the sectors of industry, design, academic/research and government there are a range of key organisations that would need to be involved to ensure any programme is effective. The key sector orientated organisations that will need to be involved with a national ecodesign initiative are likely to include the following:

Table 8 Key Organisations by Sector

Sector	Industry
Organisations	↘ Sector Associations (Plastic, Metal, Electronics, Furniture etc) ↘ Industry Training Organisations ↘ SBN ↘ EMA
Sector	Design
Organisations	↘ DINZ ↘ IPENZ
Sector	Academic/Research
Organisations	↘ Massey School(s) of Design ↘ Unitec School of Design ↘ AUT School of Design ↘ Victoria University ↘ Otago University/Polytechnic ↘ Auckland School of Engineering ↘ ICSER ↘ Canterbury School of Engineering ↘ CRI's
Sector	Government
Organisations	↘ MFE ↘ NZTE – Betterbydesign ↘ MED ↘ FRST ↘ Creative New Zealand

8.5 Tools and Methods for the NZ Context

From the range of tools and methods for ecodesign researched it is likely that New Zealand should adopt a mix of strategic methods along with some well aligned tools such as the LiDs wheel and the MET Matrix method. Preference should be placed on tools that take a life cycle approach, which is fundamental to achieving more than incremental product improvement. Care should also be taken to utilise 'solution creation' tools to enable not just the identification of problems but opportunities within ecodesign.

Each sector will have different needs from an ecodesign initiative and the tool selection process should show empathy to the different stakeholder interests.

8.6 Learning from the EU experience

The research conducted on the EU research and applications of ecodesign highlighted the key issues surrounding its implementation in industry. For the purpose of informing any New Zealand initiative, these key issues have been listed as lessons to be learnt:

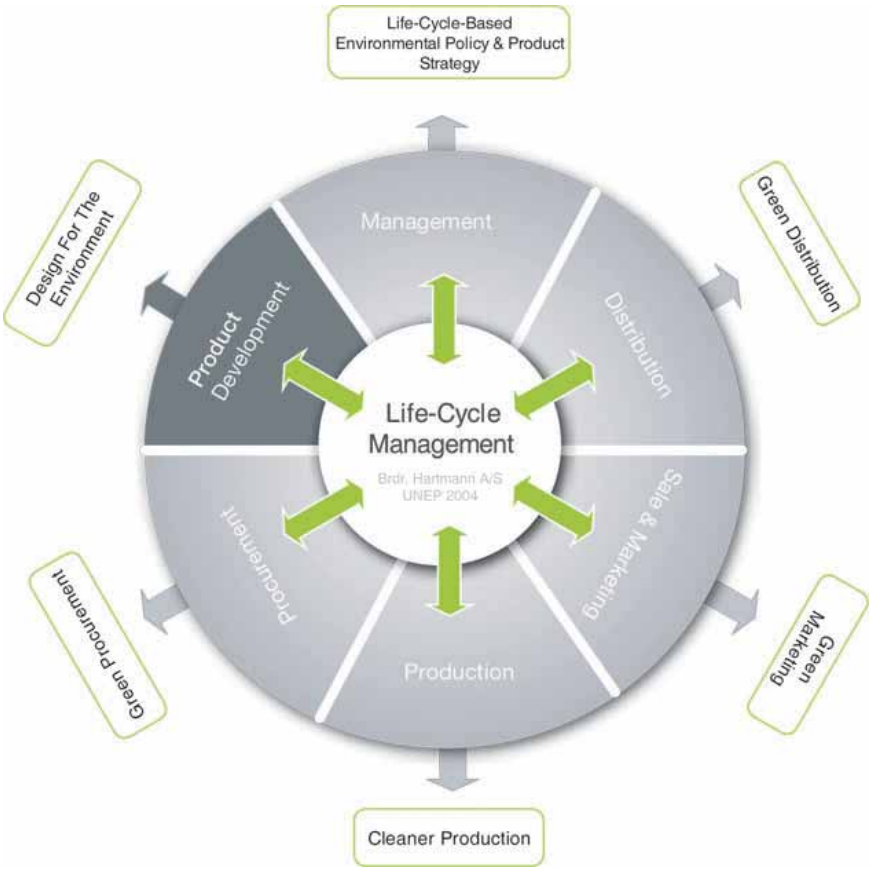
- In the tertiary sector lecturers will have to grasp and integrate the concept of sustainability into their courses.
- Integration of sustainability into existing courses is not a spontaneous process
- In the research sector there needs to be emphasis placed on models for ecodesign implementation
- Collaborative projects with industry and research sectors.
- Communicating with language all parties involved can understand
- Teaching and training methods for the entire company not just the environmental department
- Customisation of tools and methods for individual company needs rather than

a ‘one size fits all’ model

- In the EU industry sector environmental policy has had the biggest influence on the uptake of ecodesign.
- Currently the policy approach has disproportional focus on end of life issues but once industry compliance issues are resolved a broader focus on ecodesign will happen.
- Aligning ecodesign activities with day to day business operations is key to its success
- Information for raising awareness and ecodesign application needs to be widely accessible for industry members.
- Tools and methods for ecodesign need to be able to be understood and or used by all company departments.

The overarching point to be pulled from these lessons for industry applications is that there should be greater emphasis up front on ‘business integration’ through life cycle management systems. Life cycle management is the application of life cycle thinking to modern business practise.

Figure 16 Life Cycle Management



8.7 Possible Connections/Projects with the D4S Program

Through this research a link has been established directly with the D4S programme and faculty leader Han Brezet and faculty member and prominent researcher J.C Diehl. Delft has kindly expressed interest in supporting the development of ecodesign within New Zealand. This should be developed and managed at a ‘nationwide’ level and could be furthered through an exchange program for students and lecturers, and collaborative projects between Delft and a New Zealand counterpart institute or industry body.

Maintaining a strong link with Delft would greatly assist the successful implementation of ecodesign in New Zealand.

8.8 Conclusion

There is growing interest in ecodesign within New Zealand but it is critical to change the stereotypes and create a more sophisticated value added perception.
Raising the awareness of ecodesign in New Zealand with a range of stakeholders is important to implementation on a wider scale. Learning from the EU context it is essential that business integration is addressed up front to 'enable' successful ecodesign within industry on an ongoing basis. Developing resolved guides or 'toolboxes' for major sectors would help with actual implementation of ecodesign at a practical level in industry, design and education.

9 Summary Conclusion

The goal of the research is to investigate the applicability of the wider EU ecodesign experience to NZ. Although exact alignment between the EU and NZ contexts is not possible there are key lessons that can be learnt from the development of over the past 10-15 years.

The points summarised here consolidate some of the key findings discussed in this report in list form for ease of reference. These points have again been grouped by sector for clarity.

9.1 Lessons learnt in the EU over the past 15 years

Over the past fifteen years ecodesign has gone through several phases of development from the initial 'pioneer' phase of the early nineties through to the current development of product service system models. The key lessons to take from these transitional years have been:

- **Existing product redesigns can lead to significant reductions** of environment impacts
- **Inclusion of environmental tools and approaches** (technically speaking) is relatively simple
- **Successful ecodesign pilot projects are no guarantee** that the approach is being integrating on a regular day-to-day basis.
- **Eco designers must use the perceptions and opinions of all stakeholders** in the environmental strategy not just that of the scientific LCA approach
- **It is not only necessary to create new external values for ecodesign** (Higher profits, larger own market etc) it is important to take into account the interests of suppliers and end of life actors as well added value for the internal company stakeholders involved
- **POEMS (product orientated environmental management systems)** can be a great way of transforming project wise ecodesign learning into continuous and normal part of business operations
- **The first priority of a company's product strategy** should be to improve the environmental profile of those products that have a good value/cost position on the market, but relatively high eco-costs
- **For most consumers, the quality and price filters** are the first criteria when purchasing a product.

9.2 The Tertiary Sector

The teaching of ecodesign in the tertiary sector is a very recent development. Design and engineering schools have experimented with different approaches to incorporate sustainability into the curriculum with varied results. Some of the key points are:

- **A top down approach to training lecturers is counterproductive.** Where as a more collaborative approach encourages lecturers to develop upon what they already know, as opposed to being told what to do.
- All lecturers will have to **grasp and integrate the concept** of sustainability into their courses
- Integration of sustainability into existing courses is **not a spontaneous process**
- Introduction of a separate course on sustainability will initially be essential but not sufficient
- **Ecodesign is a cross-functional subject** and collides with traditional organisational structures.

9.3 The Research Sector

Ecodesign research has been primarily been academic led. This has resulted in a diverse range of tools and methods for ecodesign implementation. However, the lack of true collaboration between industry and research has created a gap between research activity and industry need. The key points in the research sector are as follows:

- **Lack of research into ecodesign integration**
- An **excessive focus on complex tools** development
- Recognition that there **needs to be a focus on tool selection** rather tool development
- **Communication of knowledge** is difficult due to language barrier
- **Problem identification not solution creation**
- Teaching and training does not mean **implementation**
- **Lack of follow up** activities after a pilot project

9.4 The Industry Sector

The uptake of ecodesign by industry has been slower than expected by those in the academic sector. The business case for ecodesign has not been strategically explored and the perceived benefits are still unclear. Although there are a few early adopters actual eco-products on the market are few and far between. Key reasons relating to this are:

- EU environmental policies have been the biggest driver for the uptake of ecodesign
- Misalignment of ecodesign with business operations
- Innovative business models and products must work financially, or it won't matter how good they are ecologically and socially
- A strong focus on end of life issues (as a result of policy compliance)
- Companies need tailor made solutions
- No universal language for ecodesign communication.
- A few front running companies but on the shelf examples of eco-products are still few and far between.
- Stakeholders' incentives are still relatively low.
- A lack of available information
- The complexity & diversity of tools for ecodesign
- A language gap between the tools and the designers

9.5 Drivers and Barriers

In the EU both internal and external drivers exist for companies to adopt an ecodesign approach. They will not all relate to the NZ context but with few compliance issues it is important to point out the driving forces and potential benefits for the uptake of ecodesign in New Zealand.

To direct a successful ecodesign implementation model it will be crucial to know what barriers stand in the way. By knowing this up front strategic plans can be made to avoid conflicting situations and work around them.

Internal drivers

- Need for increased product quality
- Image improvement
- Need to reduce costs
- Increase cost efficiency

- Increase and/or stimulate innovation
- Employee motivation
- A sense of responsibility
- Reduce environmental impact
- Gain a systems perspective
- Improve supply chain

External drivers

- Reduce environmental impact
- Decrease risk of liability (Short & Long Term)
- Government Directives and policies
- Attract customers
- Market demand/competition
- Trade/industrial organisations
- Waste charges
- Environmental requirements for design awards
- Improve supply chain

Barriers

- Lack of available information
- Creating awareness and finding relevant information
- Lack of incentives from all stakeholders
- Perceived extra costs (Time and money)
- Language gap (communication of ecodesign between all stakeholders)
- Poor alignment with business operations
- Few examples of eco-products
- Low incentives

9.6 Applying Ecodesign to the New Zealand context

New Zealand has the advantage of drawing on 15 years of ecodesign research and implementation. Some of the key points that can be drawn out for special attention are as follows:

- Awareness raising campaigns should involve the end consumer to help catalyse market driven changes
- Implementation should directly involve research, commercial and political stakeholders to provide a balanced viewpoint.
- Ecodesign projects need to be collaborative and involve a follow up programme to create a feedback loop and enable dynamic improvement of strategies, tools and ideas.
- Attention should be paid to customise tools and methods to each company context
- Tool selection should be emphasised to eliminate industry confusion
- Where focus is required, there should be a focus on tools and methods that can be utilised by a wide range of internal stakeholders within business.

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This is achieved with simple design strategies, through to more advanced analysis using life cycle assessment and systemic analysis. As a team we have an overarching commitment to sustainable product design (SPD) from research into SPD through to commercial applications of the products that we design.

Our focus has been on research and development rather than just design; we drive to deliver a basic point of difference by using research to build a platform for product development and engineering. We believe in the strategic use of design on a short, medium and long term basis.

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